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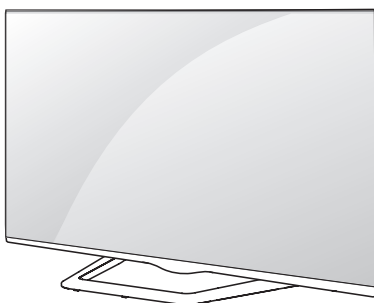
SERVICE MANUAL

CHASSIS : LD34D

MODEL: 55LA86 55LA86**-Z***

CAUTION

BEFORE SERVICING THE CHASSIS,
READ THE SAFETY PRECAUTIONS IN THIS MANUAL.



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SAFETY PRECAUTIONS

IMPORTANT SAFETY NOTICE

Many electrical and mechanical parts in this chassis have special safety-related characteristics. These parts are identified by \triangle in the Schematic Diagram and Exploded View.

It is essential that these special safety parts should be replaced with the same components as recommended in this manual to prevent Shock, Fire, or other Hazards.

Do not modify the original design without permission of manufacturer.

General Guidance

An **isolation Transformer should always be used** during the servicing of a receiver whose chassis is not isolated from the AC power line. Use a transformer of adequate power rating as this protects the technician from accidents resulting in personal injury from electrical shocks.

It will also protect the receiver and its components from being damaged by accidental shorts of the circuitry that may be inadvertently introduced during the service operation.

If any fuse (or Fusible Resistor) in this TV receiver is blown, replace it with the specified.

When replacing a high wattage resistor (Oxide Metal Film Resistor, over 1 W), keep the resistor 10 mm away from PCB.

Keep wires away from high voltage or high temperature parts.

Before returning the receiver to the customer,

always perform an **AC leakage current check** on the exposed metallic parts of the cabinet, such as antennas, terminals, etc., to be sure the set is safe to operate without damage of electrical shock.

Leakage Current Cold Check(Antenna Cold Check)

With the instrument AC plug removed from AC source, connect an electrical jumper across the two AC plug prongs. Place the AC switch in the on position, connect one lead of ohm-meter to the AC plug prongs tied together and touch other ohm-meter lead in turn to each exposed metallic parts such as antenna terminals, phone jacks, etc.

If the exposed metallic part has a return path to the chassis, the measured resistance should be between 1 M Ω and 5.2 M Ω .

When the exposed metal has no return path to the chassis the reading must be infinite.

An other abnormality exists that must be corrected before the receiver is returned to the customer.

Leakage Current Hot Check (See below Figure)

Plug the AC cord directly into the AC outlet.

Do not use a line Isolation Transformer during this check.

Connect 1.5 K / 10 watt resistor in parallel with a 0.15 μ F capacitor between a known good earth ground (Water Pipe, Conduit, etc.) and the exposed metallic parts.

Measure the AC voltage across the resistor using AC voltmeter with 1000 ohms/volt or more sensitivity.

Reverse plug the AC cord into the AC outlet and repeat AC voltage measurements for each exposed metallic part. Any voltage measured must not exceed 0.75 volt RMS which corresponds to 0.5 mA.

In case any measurement is out of the limits specified, there is possibility of shock hazard and the set must be checked and repaired before it is returned to the customer.

Leakage Current Hot Check circuit



When 25A is impressed between Earth and 2nd Ground for 1 second, Resistance must be less than 0.1 Ω

*Base on Adjustment standard

SERVICING PRECAUTIONS

CAUTION: Before servicing receivers covered by this service manual and its supplements and addenda, read and follow the **SAFETY PRECAUTIONS** on page 3 of this publication.

NOTE: If unforeseen circumstances create conflict between the following servicing precautions and any of the safety precautions on page 3 of this publication, always follow the safety precautions. Remember: Safety First.

General Servicing Precautions

1. Always unplug the receiver AC power cord from the AC power source before;

- Removing or reinstalling any component, circuit board module or any other receiver assembly.
- Disconnecting or reconnecting any receiver electrical plug or other electrical connection.
- Connecting a test substitute in parallel with an electrolytic capacitor in the receiver.

CAUTION: A wrong part substitution or incorrect polarity installation of electrolytic capacitors may result in an explosion hazard.

- Test high voltage only by measuring it with an appropriate high voltage meter or other voltage measuring device (DVM, FETVOM, etc) equipped with a suitable high voltage probe. Do not test high voltage by "drawing an arc".
- Do not spray chemicals on or near this receiver or any of its assemblies.
- Unless specified otherwise in this service manual, clean electrical contacts only by applying the following mixture to the contacts with a pipe cleaner, cotton-tipped stick or comparable non-abrasive applicator; 10 % (by volume) Acetone and 90 % (by volume) isopropyl alcohol (90 % - 99 % strength)
CAUTION: This is a flammable mixture.
Unless specified otherwise in this service manual, lubrication of contacts is not required.
- Do not defeat any plug/socket B+ voltage interlocks with which receivers covered by this service manual might be equipped.
- Do not apply AC power to this instrument and/or any of its electrical assemblies unless all solid-state device heat sinks are correctly installed.
- Always connect the test receiver ground lead to the receiver chassis ground before connecting the test receiver positive lead.
Always remove the test receiver ground lead last.
- Use with this receiver only the test fixtures specified in this service manual.
CAUTION: Do not connect the test fixture ground strap to any heat sink in this receiver.

Electrostatically Sensitive (ES) Devices

Some semiconductor (solid-state) devices can be damaged easily by static electricity. Such components commonly are called Electrostatically Sensitive (ES) Devices. Examples of typical ES devices are integrated circuits and some field-effect transistors and semiconductor "chip" components. The following techniques should be used to help reduce the incidence of component damage caused by static by static electricity.

- Immediately before handling any semiconductor component or semiconductor-equipped assembly, drain off any electrostatic charge on your body by touching a known earth ground. Alternatively, obtain and wear a commercially available discharging wrist strap device, which should be removed to prevent potential shock reasons prior to applying power to the unit under test.

- After removing an electrical assembly equipped with ES devices, place the assembly on a conductive surface such as aluminum foil, to prevent electrostatic charge buildup or exposure of the assembly.
- Use only a grounded-tip soldering iron to solder or unsolder ES devices.
- Use only an anti-static type solder removal device. Some solder removal devices not classified as "anti-static" can generate electrical charges sufficient to damage ES devices.
- Do not use freon-propelled chemicals. These can generate electrical charges sufficient to damage ES devices.
- Do not remove a replacement ES device from its protective package until immediately before you are ready to install it. (Most replacement ES devices are packaged with leads electrically shorted together by conductive foam, aluminum foil or comparable conductive material).
- Immediately before removing the protective material from the leads of a replacement ES device, touch the protective material to the chassis or circuit assembly into which the device will be installed.
CAUTION: Be sure no power is applied to the chassis or circuit, and observe all other safety precautions.
- Minimize bodily motions when handling unpackaged replacement ES devices. (Otherwise harmless motion such as the brushing together of your clothes fabric or the lifting of your foot from a carpeted floor can generate static electricity sufficient to damage an ES device.)

General Soldering Guidelines

- Use a grounded-tip, low-wattage soldering iron and appropriate tip size and shape that will maintain tip temperature within the range of 500 °F to 600 °F.
- Use an appropriate gauge of RMA resin-core solder composed of 60 parts tin/40 parts lead.
- Keep the soldering iron tip clean and well tinned.
- Thoroughly clean the surfaces to be soldered. Use a mall wire-bristle (0.5 inch, or 1.25 cm) brush with a metal handle. Do not use freon-propelled spray-on cleaners.
- Use the following unsoldering technique
 - Allow the soldering iron tip to reach normal temperature. (500 °F to 600 °F)
 - Heat the component lead until the solder melts.
 - Quickly draw the melted solder with an anti-static, suction-type solder removal device or with solder braid.
CAUTION: Work quickly to avoid overheating the circuit board printed foil.
- Use the following soldering technique.
 - Allow the soldering iron tip to reach a normal temperature (500 °F to 600 °F)
 - First, hold the soldering iron tip and solder the strand against the component lead until the solder melts.
 - Quickly move the soldering iron tip to the junction of the component lead and the printed circuit foil, and hold it there only until the solder flows onto and around both the component lead and the foil.
CAUTION: Work quickly to avoid overheating the circuit board printed foil.
- Closely inspect the solder area and remove any excess or splashed solder with a small wire-bristle brush.

IC Remove/Replacement

Some chassis circuit boards have slotted holes (oblong) through which the IC leads are inserted and then bent flat against the circuit foil. When holes are the slotted type, the following technique should be used to remove and replace the IC. When working with boards using the familiar round hole, use the standard technique as outlined in paragraphs 5 and 6 above.

Removal

1. Desolder and straighten each IC lead in one operation by gently prying up on the lead with the soldering iron tip as the solder melts.
2. Draw away the melted solder with an anti-static suction-type solder removal device (or with solder braid) before removing the IC.

Replacement

1. Carefully insert the replacement IC in the circuit board.
2. Carefully bend each IC lead against the circuit foil pad and solder it.
3. Clean the soldered areas with a small wire-bristle brush. (It is not necessary to reapply acrylic coating to the areas).

"Small-Signal" Discrete Transistor

Removal/Replacement

1. Remove the defective transistor by clipping its leads as close as possible to the component body.
2. Bend into a "U" shape the end of each of three leads remaining on the circuit board.
3. Bend into a "U" shape the replacement transistor leads.
4. Connect the replacement transistor leads to the corresponding leads extending from the circuit board and crimp the "U" with long nose pliers to insure metal to metal contact then solder each connection.

Power Output, Transistor Device

Removal/Replacement

1. Heat and remove all solder from around the transistor leads.
2. Remove the heat sink mounting screw (if so equipped).
3. Carefully remove the transistor from the heat sink of the circuit board.
4. Insert new transistor in the circuit board.
5. Solder each transistor lead, and clip off excess lead.
6. Replace heat sink.

Diode Removal/Replacement

1. Remove defective diode by clipping its leads as close as possible to diode body.
2. Bend the two remaining leads perpendicular y to the circuit board.
3. Observing diode polarity, wrap each lead of the new diode around the corresponding lead on the circuit board.
4. Securely crimp each connection and solder it.
5. Inspect (on the circuit board copper side) the solder joints of the two "original" leads. If they are not shiny, reheat them and if necessary, apply additional solder.

Fuse and Conventional Resistor

Removal/Replacement

1. Clip each fuse or resistor lead at top of the circuit board hollow stake.
2. Securely crimp the leads of replacement component around notch at stake top.

3. Solder the connections.

CAUTION: Maintain original spacing between the replaced component and adjacent components and the circuit board to prevent excessive component temperatures.

Circuit Board Foil Repair

Excessive heat applied to the copper foil of any printed circuit board will weaken the adhesive that bonds the foil to the circuit board causing the foil to separate from or "lift-off" the board. The following guidelines and procedures should be followed whenever this condition is encountered.

At IC Connections

To repair a defective copper pattern at IC connections use the following procedure to install a jumper wire on the copper pattern side of the circuit board. (Use this technique only on IC connections).

1. Carefully remove the damaged copper pattern with a sharp knife. (Remove only as much copper as absolutely necessary).
2. Carefully scratch away the solder resist and acrylic coating (if used) from the end of the remaining copper pattern.
3. Bend a small "U" in one end of a small gauge jumper wire and carefully crimp it around the IC pin. Solder the IC connection.
4. Route the jumper wire along the path of the out-away copper pattern and let it overlap the previously scraped end of the good copper pattern. Solder the overlapped area and clip off any excess jumper wire.

At Other Connections

Use the following technique to repair the defective copper pattern at connections other than IC Pins. This technique involves the installation of a jumper wire on the component side of the circuit board.

1. Remove the defective copper pattern with a sharp knife. Remove at least 1/4 inch of copper, to ensure that a hazardous condition will not exist if the jumper wire opens.
2. Trace along the copper pattern from both sides of the pattern break and locate the nearest component that is directly connected to the affected copper pattern.
3. Connect insulated 20-gauge jumper wire from the lead of the nearest component on one side of the pattern break to the lead of the nearest component on the other side. Carefully crimp and solder the connections.

CAUTION: Be sure the insulated jumper wire is dressed so the it does not touch components or sharp edges.

SPECIFICATION

NOTE : Specifications and others are subject to change without notice for improvement.

1. Application range

This specification is applied to the LED TV used LD34D chassis.

2. Requirement for Test

Each part is tested as below without special appointment.

- 1) Temperature: 25 °C ± 5 °C(77 °F ± 9 °F), CST: 40 °C ± 5 °C
- 2) Relative Humidity: 65 % ± 10 %
- 3) Power Voltage
 - : Standard input voltage (AC 100-240 V~, 50/60 Hz)
 - * Standard Voltage of each products is marked by models.
- 4) Specification and performance of each parts are followed each drawing and specification by part number in accordance with BOM.
- 5) The receiver must be operated for about 20 minutes prior to the adjustment.

3. Test method

- 1) Performance: LGE TV test method followed
- 2) Demanded other specification
 - Safety : CE, IEC specification
 - EMC : CE, IEC
 - Wireless : Wireless HD Specification (Option)

4. Model General Specification

No.	Item	Specification	Remarks
1	Market	EU(PAL Market-36Countries)/CIS + Morocco(Africa)	<p>DTV & Analog (Total 37 countries)</p> <p>DTV (MPEG2/4, DVB-T) : 30 countries Germany, Netherland, Switzerland, Hungary, Austria, Slovenia, Bulgaria, France, Spain, Italy, Belgium, Russia, Luxemburg, Greece, Czech, Croatia, Turkey, Moroco, Ireland, Latvia, Estonia, Lithuania, Poland, Portugal, Romania, Albania, Bosnia, Serbia, Slovakia, Beralus</p> <p>DTV (MPEG2/4, DVB-T2) : 8 countries UK(Ireland), Sweden, Denmark, Finland, Norway, Ukraine, Kazakhstan, Russia</p> <p>DTV (MPEG2/4, DVB-C) : 37 countries Germany, Netherland, Switzerland, Hungary, Austria, Slovenia, Bulgaria, France, Spain, Italy, Belgium, Russia, Luxemburg, Greece, Czech, Croatia, Turkey, Moroco, Ireland, Latvia, Estonia, Lithuania, Poland, Portugal, Romania, Albania, Bosnia, Serbia, Slovakia, Beralus, UK, Sweden, Denmark, Finland, Norway, Ukraine, Kazakhstan</p> <p>DTV (MPEG2/4, DVB-S/S2) : 30 countries Germany, Netherland, Switzerland, Hungary, Austria, Slovenia, Bulgaria, France, Spain, Italy, Belgium, Russia, Luxemburg, Greece, Czech, Croatia, Turkey, Moroco, Ireland, Latvia, Estonia, Lithuania, Poland, Portugal, Romania, Albania, Bosnia, Serbia, Slovakia, Beralus, UK, Sweden, Denmark, Finland, Norway, Ukraine, Kazakhstan</p> <p>Supported satellite : 29 satellites ABS1 75.0E/ AMOS 4.0W/ ASIATSATS 105.5E/ ASTRA1LHMKR 19.2E/ ASTRA2ABD 28.2E/ ASTRA3AB 23.5E/ ASTRA4A 4.8E/ ATLANTICBIRD2 8.0W/ ATLANTICBIRD3 5.0W/ BADR 26.0E/ EURO-BIRD3 33.0E/ EURO-BIRD9A 9.0E/ EUTELSATW2A 10.E/ EUTELSATW3A 7.0E/ EUTELSATW4W7 36.0E/ EUTELSESAT 16.0E/ EXPRESSAM1 40.0E/ EXPRESAM3 140.0E/ EXPRESSAM33 96.5E/ HELLASAT2 39.0E/ HISPASAT1CDE 30.0W/ HOTBIRD 13.0E/ INTELSAT10&7 68.5E/ INTELSAT15 85.2E/ INTELSAT904 60.0E/ NILESAT 7.0W/ THOR 0.8W/ TURKSAT 42.0E/ YAMAL201 90.0E</p>

No.	Item	Specification	Remarks
2	Broadcasting system	1) PAL-BG/DK/I/I' 2) SECAM L/L', DK, BG, I 3) DVB-T/T2, C, S/S2	
3	Program coverage	1) Digital TV - VHF, UHF - C-Band, Ku-Band 2) Analogue TV -VHF : E2 to E12 -UHF : E21 to E69 -CATV : S1 to S20 -HYPER : S21 to S47	
4	Receiving system	Analog : Upper Heterodyne Digital : COFDM, QAM	<p>► DVB-T</p> <ul style="list-style-type: none"> - Guard Interval(Bitrate_Mbit/s) 1/4, 1/8, 1/16, 1/32 - Modulation : Code Rate QPSK : 1/2, 2/3, 3/4, 5/6, 7/8 16-QAM : 1/2, 2/3, 3/4, 5/6, 7/8 64-QAM : 1/2, 2/3, 3/4, 5/6, 7/8 <p>► DVB-T2</p> <ul style="list-style-type: none"> - Guard Interval(Bitrate_Mbit/s) 1/4, 1/8, 1/16, 1/32, 1/128, 19/128, 19/256, - Modulation : Code Rate QPSK : 1/2, 2/5, 2/3, 3/4, 5/6 16-QAM : 1/2, 2/5, 2/3, 3/4, 5/6 64-QAM : 1/2, 2/5, 2/3, 3/4, 5/6 256-QAM : 1/2, 2/5, 2/3, 3/4, 5/6 <p>► DVB-C</p> <ul style="list-style-type: none"> - Symbolrate : 4.0Msymbols/s to 7.2 Msymbols/s - Modulation : 16QAM, 64-QAM, 128-QAM and 256-QAM <p>► DVB-S/S2</p> <ul style="list-style-type: none"> - symbolrate : DVB-S2 (8PSK / QPSK) : 2 ~ 45 Msymbol/s DVB-S (QPSK) : 2 ~ 45 Msymbol/s - viterbi DVB-S mode : 1/2, 2/3, 3/4, 5/6, 7/8 DVB-S2 mode : 1/2, 2/3, 3/4, 3/5, 4/5, 5/6, 8/9, 9/10
5	Input Voltage	AC 100 ~ 240 V, 50/60 Hz	

5. External input format

5.1. 2D Mode

(1) Component input(Y, CB/PB, CR/PR)

No.	Resolution	H-freq(kHz)	V-freq(Hz)	
1.	720×480	15.73	60.00	SDTV, DVD 480i
2.	720×480	15.63	59.94	SDTV, DVD 480i
3.	720×480	31.47	59.94	480p
4.	720×480	31.50	60.00	480p
5.	720×576	15.625	50.00	SDTV 576i
6.	720×576	31.25	50.00	SDTV 576p
7.	1280×720	45.00	50.00	HDTV 720p
8.	1280×720	44.96	59.94	HDTV 720p
9.	1280×720	45.00	60.00	HDTV 720p
10.	1920×1080	31.25	50.00	HDTV 1080i
11.	1920×1080	33.75	60.00	HDTV 1080i
12.	1920×1080	33.72	59.94	HDTV 1080i
13.	1920×1080	56.250	50	HDTV 1080p
14.	1920×1080	67.5	60	HDTV 1080p

(2) HDMI Input (PC/DTV)

No.	Resolution	H-freq(kHz)	V-freq.(Hz)	Pixel clock(MHz)	VIC	Proposed	
HDMI-PC							DDC
1	640*350	31.468	70.09	25.17		EGA	X
2	720*400	31.469	70.08	28.32		DOS	O
3	640*480	31.469	59.94	25.17		VESA(VGA)	O
4	800*600	37.879	60.31	40.00		VESA(SVGA)	O
5	1024*768	48.363	60.00	65.00		VESA(XGA)	O
6	1152*864	54.348	60.053	80		VESA	
7	1280*1024	63.981	60.020	108		VESA(SXGA)	O
8	1360*768	47.712	60.015	85.5		VESA(WXGA)	O
9	1920*1080	67.5	60.00	148.5		WUXGA(CEA861D)	O
HDMI-DTV							
1	640*480	31.469 / 31.5	59.94/ 60	25.125	1	SDTV 480P	
2	720*480	31.469 / 31.5	59.94 / 60	27.00/27.03	2,3	SDTV 480P	
3	720*576	31.25	50	27	17,18	SDTV 576P	
4	720*576	15.625	50	27	21	SDTV 576I	
5	1280*720	37.500	50	74.25	19	HDTV 720P	
6	1280*720	44.96 / 45	59.94 / 60	74.17/74.25	4	HDTV 720P	
7	1920*1080	33.72 / 33.75	59.94 / 60	74.17/74.25	5	HDTV 1080I	
8	1920*1080	28.125	50.00	74.25	20	HDTV 1080I	
9	1920*1080	26.97 / 27	23.97 / 24	74.17/74.25	32	HDTV 1080P	
10	1920*1080		25		33	HDTV 1080P	
11	1920*1080	33.716 / 33.75	29.976 / 30.00	74.25	34	HDTV 1080P	
12	1920*1080	56.250	50	148.5	31	HDTV 1080P	
13	1920*1080	67.43 / 67.5	59.94 / 60	148.35/148.50	16	HDTV 1080P	

5.2. 3D Mode

(1) RF Input(3D supported mode manually)

No.	Resolution	Proposed	3D input proposed mode
1	HD - DTV	1080I 720P	2D to 3D Side by Side(Half) Top & Bottom
2	SD - DTV	576P 576I	
3	SD - ATV(CVBS/SCART)		

(2) RF Input(3D supported mode automatically)

No.	Signal	3D input proposed mode
1	Frame Compatible	Side by Side(Half), Top & Bottom

(3) HDMI 1.3 (3D supported mode manually)

No	Resolution	H-freq(kHz)	V-freq.(Hz)	Pixel clock(MHz)	Proposed	3D input proposed mode
1	720*480	31.5	60	27.03	SDTV 480P	2D to 3D, Side by Side(Half), Top & Bottom, Checker Board, Frame Sequential, Row Interleaving, Column Interleaving
2	720*576	31.25	50	27	SDTV 576P	
3	1280*720	45.00	60.00	74.25	HDTV 720P	
4	1280*720	37.500	50	74.25	HDTV 720P	2D to 3D, Side by Side(Half), Top & Bottom
5	1920*1080	33.75	60.00	74.25	HDTV 1080I	
6	1920*1080	28.125	50.00	74.25	HDTV 1080I	
7	1920*1080	27.00	24.00	74.25	HDTV 1080P	2D to 3D, Side by Side(Half), Top & Bottom, Checker Board, Row Interleaving, Column Interleaving
8	1920*1080	28.12	25	74.25	HDTV 1080P	
9	1920*1080	33.75	30.00	74.25	HDTV 1080P	
10	1920*1080	67.50	60.00	148.5	HDTV 1080P	2D to 3D, Side by Side(Half), Top & Bottom, Checker Board, Single Frame Sequential, Row Interleaving, Column Interleaving
11	1920*1080	56.250	50	148.5	HDTV 1080P	

(4) HDMI 1.4b (3D supported mode automatically)

No.	Resolution	H-freq(kHz)	V-freq.(Hz)	Pixel clock(MHz)	VIC	3D input proposed mode	Proposed
1	640*480	31.469 / 31.5	59.94/ 60	25.125/25.2	1	Top-and-Bottom Side-by-side(half)	Secondary(SDTV 480P) Secondary(SDTV 480P)
2		62.938/63	59.94/ 60	50.35/50.4	1	Frame packing Line alternative	Secondary(SDTV 480P) (SDTV 480P)
3		31.469 / 31.5	59.94/ 60	50.35/50.4	1	Side-by-side(Full)	(SDTV 480P)
4	720*480	31.469 / 31.5	59.94 / 60	27.00/27.03	2,3	Top-and-Bottom Side-by-side(half)	Secondary(SDTV 480P) Secondary(SDTV 480P)
5		62.938/63	59.94 / 60	54/54.06	2,3	Frame packing Line alternative	Secondary(SDTV 480P) (SDTV 480P)
6		31.469 / 31.5	59.94 / 60	54/54.06	2,3	Side-by-side(Full)	(SDTV 480P)
7	720*576	31.25	50	27	17,18	Top-and-Bottom Side-by-side(half)	Secondary(SDTV 576P) Secondary(SDTV 576P)
8		62.5	50	54	17,18	Frame packing Line alternative	Secondary(SDTV 576P) (SDTV 576P)
9		31.25	50	54	17,18	Side-by-side(Full)	(SDTV 576P)
10	1280*720	37.500	50	74.25	19	Top-and-Bottom Side-by-side(half)	Primary(HDTV 720P) Primary(HDTV 720P)
11		75	50	148.5	19	Frame packing Field alternative	Primary(HDTV 720P) (HDTV 720P)
12		37.500	50	148.5	19	Side-by-side(Full)	(HDTV 720P)
13		44.96 / 45	59.94 / 60	74.18/74.25	4	Top-and-Bottom Side-by-side(half)	Primary(HDTV 720P) Primary(HDTV 720P)
14		89.91/90	59.94 / 60	148.35/148.5	4	Frame packing Line alternative	Primary(HDTV 720P) (HDTV 720P)
15		44.96 / 45	59.94 / 60	148.35/148.5	4	Side-by-side(Full)	(HDTV 720P)
16	1920*1080	33.72 / 33.75	59.94 / 60	74.18/74.25	5	Top-and-Bottom Side-by-side(half)	Secondary(HDTV 1080I) Primary(HDTV 1080I)
17		67.432/67.50	59.94 / 60	148.35/148.5	5	Frame packing Line alternative	Primary(HDTV 1080I) (HDTV 1080I)
18		33.72 / 33.75	59.94 / 60	148.35/148.5	5	Side-by-side(Full)	(HDTV 1080I)
19		28.125	50.00	74.25	20	Top-and-Bottom Side-by-side(half)	Secondary(HDTV 1080I) Primary(HDTV 1080I)
20		56.25	50.00	148.5	20	Frame packing Field alternative	Primary(HDTV 1080I) (HDTV 1080I)
21		28.125	50.00	148.5	20	Side-by-side(Full)	(HDTV 1080I)
22		26.97 / 27	23.97 / 24	74.18/74.25	32	Top-and-Bottom Side-by-side(half)	Primary(HDTV 1080P) Primary(HDTV 1080P)
23		43.94/54	23.97 / 24	148.35/148.5	32	Frame packing Field alternative	Primary(HDTV 1080P) (HDTV 1080P)
24		26.97 / 27	23.97 / 24	148.35/148.5	32	Side-by-side(Full)	(HDTV 1080P)
25		28.12	25	74.25	33	Top-and-Bottom Side-by-side(half)	Primary(HDTV 1080P) Primary(HDTV 1080P)
26		56.24	25	148.5	33	Frame packing Line alternative	Primary(HDTV 1080P) (HDTV 1080P)
27		28.12	25	148.5	33	Side-by-side(Full)	(HDTV 1080P)
28		33.716 / 33.75	29.976 / 30.00	74.18/74.25	34	Top-and-Bottom Side-by-side(half)	Secondary(HDTV 1080P) Secondary(HDTV 1080P)
29		67.432 / 67.5	29.976 / 30.00	148.35/148.5	34	Frame packing Line alternative	Secondary(HDTV 1080P) (HDTV 1080P)
30		33.716 / 33.75	29.976 / 30.00	148.35/148.5	34	Side-by-side(Full)	(HDTV 1080P)
31		56.250	50	148.5	31	Top-and-Bottom Side-by-side(half)	Primary(HDTV 1080P) Secondary(HDTV 1080P)
32		67.43 / 67.5	59.94 / 60	148.35/148.50	16	Top-and-Bottom Side-by-side(half)	Primary(HDTV 1080P) Secondary(HDTV 1080P)

(5) HDMI-PC Input (3D) (3D supported mode manually)

No.	Resolution	H-freq(kHz)	V-freq.(Hz)	Pixel clock(MHz)	3D input proposed mode	Proposed
1	1024*768	48.36	60	65	2D to 3D, Side by Side(half) Top & Bottom	HDTV 768P
2	1360*768	47.71	60	85.5	2D to 3D, Side by Side(half) Top & Bottom	HDTV 768P
3	1920*1080	67.500	60	148.50	2D to 3D, Side by Side(half) Top & Bottom, Checker Board, Single Frame Sequential, Row Interleaving, Column Interleaving	HDTV 1080P
4	Others	-	-	-	2D to 3D	640*350 720*400 640*480 800*600 1152*864

(6) Component Input (3D) (3D supported mode manually)

No.	Resolution	H-freq(kHz)	V-freq.(Hz)	Pixel clock	3D input proposed mode	Proposed
1	1280*720	37.5	50	74.25	2D to 3D, Side by Side, Top & Bottom	HDTV 720P
2	1280*720	45.00	60.00	74.25	2D to 3D, Side by Side, Top & Bottom	HDTV 720P
3	1280*720	44.96	59.94	74.176	2D to 3D, Side by Side, Top & Bottom	HDTV 720P
4	1920*1080	33.75	60.00	74.25	2D to 3D, Side by Side, Top & Bottom	HDTV 1080I
5	1920*1080	33.72	59.94	74.176	2D to 3D, Side by Side, Top & Bottom	HDTV 1080I
6	1920*1080	28.12	50	74.25	2D to 3D, Side by Side, Top & Bottom	HDTV 1080I
7	1920*1080	67.500	60	148.50	2D to 3D, Side by Side, Top & Bottom	HDTV 1080P
8	1920*1080	67.432	59.94	148.352	2D to 3D, Side by Side, Top & Bottom	HDTV 1080P
9	1920*1080	27.000	24.000	74.25	2D to 3D, Side by Side, Top & Bottom	HDTV 1080P
10	1920*1080	28.12	25	74.25	2D to 3D, Side by Side, Top & Bottom	HDTV 1080P
11	1920*1080	56.25	50	74.25	2D to 3D, Side by Side, Top & Bottom	HDTV 1080P
12	1920*1080	26.97	23.976	74.176	2D to 3D, Side by Side, Top & Bottom	HDTV 1080P
13	1920*1080	33.75	30.000	74.25	2D to 3D, Side by Side, Top & Bottom	HDTV 1080P
14	1920*1080	33.71	29.97	74.176	2D to 3D, Side by Side, Top & Bottom	HDTV 1080P

(7) USB, DLNA – Movie (3D) (3D supported mode manually)

No.	Resolution	H-freq(kHz)	V-freq.(Hz)	Pixel clock(MHz)	3D input proposed mode
1	Under 704x480				2D to 3D
2	Over 704x480 interlaced				2D to 3D, Side by Side(Half), Top & Bottom
3	Over 704x480 progressive		50 / 60		2D to 3D, Side by Side(Half), Top & Bottom, Checker Board, Row Interleaving, Column Interleaving, Frame Sequential
4			others		2D to 3D, Side by Side(Half), Top & Bottom, Checker Board, Row Interleaving, Column Interleaving









(8) USB, DLNA -Photo (3D) (3D supported mode manually)

No.	Resolution	H-freq(kHz)	V-freq.(Hz)	Pixel clock(MHz)	3D input proposed mode
1	Under 320x240	-	-	-	2D to 3D
2	Over 320x240	-	-	-	2D to 3D, Side by Side(Half), Top & Bottom

(9) USB, DLNA (3D) (3D supported mode automatically)

No.	Resolution	H-freq(kHz)	V-freq.(Hz)	Pixel clock(MHz)	3D input proposed mode
1	1080p	33.75	30	74.25	Side by Side(Half), Top & Bottom, Checker Board, MPO(Photo), JPS(Photo)

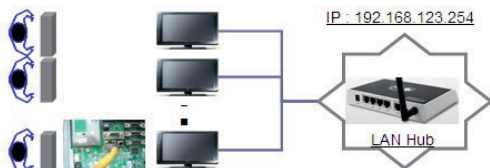
■ Remark: 3D Input mode

No.	Side by Side	Top & Bottom	Checker board	Single Frame Sequential	Frame Packing	Line Interleaving	Column Interleaving	2D to 3D
1								

3.3. LAN Inspection

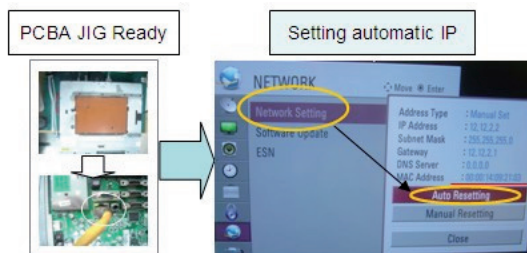
3.3.1. Equipment & Condition

- Each other connection to LAN Port of IP Hub and Jig



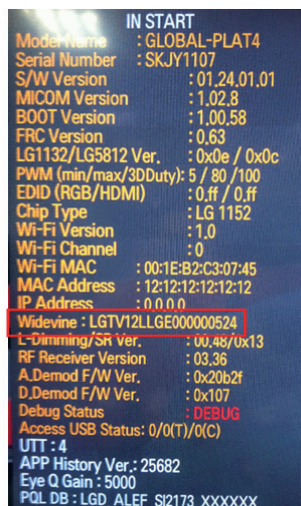
3.3.2. LAN inspection solution

- LAN Port connection with PCB
- Network setting at MENU Mode of TV
- Setting automatic IP
- Setting state confirmation
 - If automatic setting is finished, you confirm IP and MAC Address.



3.3.3. WIDEVINE key Inspection

- Confirm key input data at the "IN START" MENU Mode.



3.4. LAN PORT INSPECTION(PING TEST)

Connect SET → LAN port == PC → LAN Port

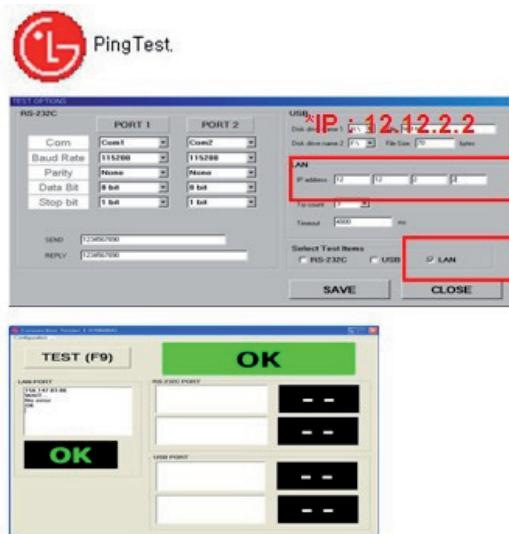


3.4.1. Equipment setting

- Play the LAN Port Test PROGRAM.
- Input IP set up for an inspection to Test Program.
*IP Number : 12.12.2.2

3.4.2. LAN PORT inspection(PING TEST)

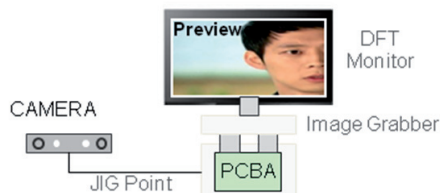
- Play the LAN Port Test Program.
- Connect each other LAN Port Jack.
- Play Test (F9) button and confirm OK Message.
- Remove LAN cable.



3.5. Camera Port Inspection

- Objective : To check PCBA's CAMERA Port.
- How-it-works
 - Connect the PCBA like below Picture.
 - Send specific RS-232C command for displaying Camera Preview.

* CAMERA need to be status of Slide up.



3) RS-232C Command

RS-232C COMMAND			Explanation
CMD	DATA	ID	
ai	00	23	Camera Function Start.
ai	00	24	Camera Function End.

3.6. Model name & Serial number Download

3.6.1. Model name & Serial number D/L

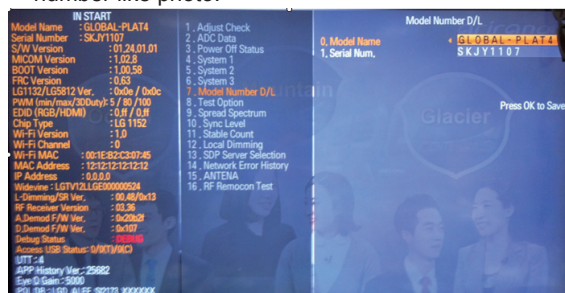
- Press "Power on" key of service remote control.
(Baud rate : 115200 bps)
- Connect RS-232C Signal to USB Cable to USB.
- Write Serial number by use USB port.
- Must check the serial number at Instart menu.

3.6.2. Method & notice

- Serial number D/L is using of scan equipment.
- Setting of scan equipment operated by Manufacturing Technology Group.
- Serial number D/L must be conformed when it is produced in production line, because serial number D/L is mandatory by D-book 4.0.

* Manual Download (Model Name and Serial Number)
If the TV set is downloaded by OTA or service man, sometimes model name or serial number is initialized.(Not always)
It is impossible to download by bar code scan, so It need Manual download.

- Press the "Instart" key of Adjustment remote control.
- Go to the menu "7.Model Number D/L" like below photo.
- Input the Factory model name(ex 47LM960V-ZB) or Serial number like photo.



- Check the model name Instart menu. → Factory name displayed. (ex 47LM960V-ZB)
- Check the Diagnostics.(DTV country only) → Buyer model displayed. (ex 47LM960V-ZB)

3.7. CI+ Key checking method

* Check the Section 3.2

Check whether the key was downloaded or not at 'In Start' menu. (Refer to below).



=> Check the Download to CI+ Key value in LGset.

3.7.1. Check the method of CI+ Key value

- Check the method on Instart menu
- Check the method of RS232C Command
 - Into the main ass'y mode(RS232: aa 00 00)

CMD 1	CMD 2	Data 0
A	A	0 0

- Check the key download for transmitted command (RS232: ci 00 10)

CMD 1	CMD 2	Data 0
C	I	1 0

- Result value

- Normally status for download : OKx
- Abnormally status for download : NGx

3.7.2. Check the method of CI+ key value(RS232)

- Into the main ass'y mode(RS232: aa 00 00)

CMD 1	CMD 2	Data 0
A	A	0 0

- Check the mothod of CI+ key by command (RS232: ci 00 20)

CMD 1	CMD 2	Data 0
C	I	2 0

- Result value

i 01 OK 1d1852d21c1ed5dcx

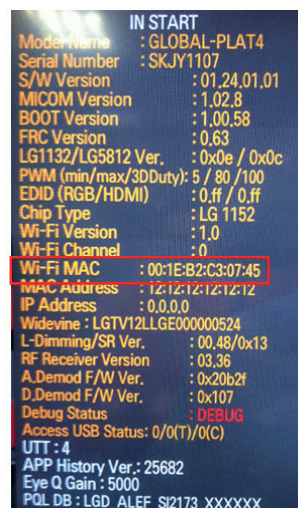
→ CI+ Key Value

3.8. WIFI MAC ADDRESS CHECK

- Using RS232 Command

	H-freq(kHz)	V-freq.(Hz)
Transmission	[A][I][Set ID][20][Cr]	[O][K][X] or [NG]

- Check the menu on in-start



4. Manual Adjustment

* ADC adjustment is not needed because of OTP(Auto ADC adjustment)

4.1. EDID(The Extended Display Identification Data)/DDC(Display Data Channel) download

4.1.1. Overview

It is a VESA regulation. A PC or a MNT will display an optimal resolution through information sharing without any necessity of user input. It is a realization of "Plug and Play".

4.1.2. Equipment

- Since embedded EDID data is used, EDID download JIG, HDMI cable and D-sub cable are not need.
- Adjustment remote control

4.1.3. Download method

- (1) Press "ADJ" key on the Adjustment remote control then select "10.EDID D/L", By pressing "Enter" key, enter EDID D/L menu.
- (2) Select "Start" button by pressing "Enter" key, HDMI1/ HDMI2/ HDMI3/ HDMI4/ RGB are writing and display OK or NG.



4.1.4. EDID DATA

• HDMI

	0x00	0x01	0x02	0x03	0x04	0x05	0x06	0x07	0x08	0x09	0x0A	0x0B	0x0C	0x0D	0x0E	0x0F
0x00	00	FF	FF	FF	FF	FF	FF	00	1E	6D	a		b			
0x01	c		01	03	80	A0	5A	78	0A	EE	91	A3	54	4C	99	26
0x02	0F	50	54	A1	08	00	31	40	45	40	61	40	71	40	81	80
0x03	01	01	01	01	01	01	02	3A	80	18	71	38	2D	40	58	2C
0x04	45	00	40	84	63	00	00	1E	66	21	50	B0	51	00	1B	30
0x05	40	70	36	00	40	84	63	00	00	1E	00	00	00	FD	00	3A
0x06	3E	1E	53	10	00	0A	20	20	20	20	20	20	d			
0x07	d														01	e1
0x08	02	03	3A	F1	4E	10	9F	04	13	05	14	03	02	12	20	21
0x09	22	15	01	29	3D	06	C0	15	07	50	09	57	07	f		
0x0A	f															
0x0B	f					E3	05	03	01	02	3A	80	18	71	38	40
0x0C	2D	40	58	2C	45	00	40	84	63	00	00	1E	01	1D	80	18
0x0D	71	1C	16	20	58	2C	25	00	40	84	63	00	00	9E	01	1D
0x0E	00	72	51	D0	1E	20	6E	28	55	00	40	84	63	00	00	1E
0x07	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	e2

• Reference

- HDMI1 ~ HDMI4
- In the data of EDID, bellows may be different by S/W or Input mode.

(a) Product ID

MODEL NAME	HEX	EDID Table	DDC Function
HD/FHD Model	0001	01 00	Analog/Digital

(b) Serial No: Controlled on production line.

(c) Month, Year: Controlled on production line:

ex) Monthly : '01' → '01', Year : '2013' → '17'

(d) Model Name(Hex): LGTV

Cf) TV set's model name in EDID data is below.

MODEL NAME	MODEL NAME(HEX)
LG TV	00 00 00 FC 00 4C 47 20 54 56 0A 20 20 20 20 20 20 (LG TV)

(e) Checksum(LG TV): Changeable by total EDID data.

EDID C/S data		FHD
		HDMI
check sum (Hex)	Block 0	42
	Block 1	23 (HDMI1)
		13 (HDMI2)

(f) Vendor Specific(HDMI)

INPUT	MODEL NAME(HEX)
HDMI1	78030C001000801E
HDMI2	78030C002000801E

(1) EDID

HDMI 1(C/S : E8 81)

EDID Block 0, Bytes 0-127 [00H-7FH]

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	00	FF	FF	FF	FF	FF	FF	00	1E	6D	01	00	01	01	01	01
10	01	17	01	03	80	A0	5A	78	0A	EE	91	A3	54	4C	99	26
20	0F	50	54	A1	08	00	31	40	45	40	61	40	71	40	81	80
30	01	01	01	01	01	01	02	3A	80	18	71	38	2D	40	58	2C
40	45	00	40	84	63	00	00	1E	66	21	50	B0	51	00	1B	30
50	40	70	36	00	40	84	63	00	00	1E	00	00	00	FD	00	3A
60	3E	1E	53	10	00	0A	20	20	20	20	20	20	20	00	00	FC
70	00	4C	47	20	54	56	0A	20	20	20	20	20	20	20	01	E8

EDID Block 1, Bytes 128-255 [80H-FFH]

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
80	02	03	3A	F1	4E	10	9F	04	13	05	14	03	02	12	20	21
90	22	15	01	29	3D	06	C0	15	07	50	09	57	07	78	03	0C
A0	00	10	00	B8	2D	20	C0	0E	01	4F	3F	FC	08	10	18	10
B0	06	10	16	10	28	10	E3	05	03	01	02	3A	80	18	71	38
C0	2D	40	58	2C	45	00	40	84	63	00	00	1E	01	1D	80	18
D0	71	1C	16	20	58	2C	25	00	40	84	63	00	00	9E	01	1D
E0	00	72	51	D0	1E	20	6E	28	55	00	40	84	63	00	00	1E
F0	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	81

HDMI 2(C/S : E8 71)

EDID Block 0, Bytes 0-127 [00H-7FH]

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	00	FF	FF	FF	FF	FF	FF	00	1E	6D	01	00	01	01	01	01
10	01	17	01	03	80	A0	5A	78	0A	EE	91	A3	54	4C	99	26
20	0F	50	54	A1	08	00	31	40	45	40	61	40	71	40	81	80
30	01	01	01	01	01	01	02	3A	80	18	71	38	2D	40	58	2C
40	45	00	40	84	63	00	00	1E	66	21	50	B0	51	00	1B	30
50	40	70	36	00	40	84	63	00	00	1E	00	00	00	FD	00	3A
60	3E	1E	53	10	00	0A	20	20	20	20	20	20	20	00	00	FC
70	00	4C	47	20	54	56	0A	20	20	20	20	20	20	20	01	E8

EDID Block 1, Bytes 128-255 [80H-FFH]

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	02	03	37	F1	4E	10	9F	04	13	05	14	03	02	12	20	21
10	22	15	01	26	15	07	50	09	57	07	78	03	0C	00	20	00
20	B8	2D	20	C0	0E	01	4F	3F	FC	08	10	18	10	06	10	16
30	10	28	10	E3	05	03	01	02	3A	80	18	71	38	2D	40	58
40	2C	45	00	A0	5A	00	00	00	1E	01	1D	80	18	71	1C	16
50	20	58	2C	25	00	A0	5A	00	00	9E	01	1D	00	72	51	
60	D0	1E	20	6E	28	55	00	A0	5A	00	00	00	1E	00	00	00
70	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	01

HDMI 3(C/S : E8 61)

EDID Block 0, Bytes 0-127 [00H-7FH]

0	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	00	FF	FF	FF	FF	FF	FF	00	1E	6D	01	00	01	01	01	01
10	01	17	01	03	80	A0	5A	78	0A	EE	91	A3	54	4C	99	26
20	0F	50	54	A1	08	00	31	40	45	40	61	40	71	40	81	80
30	01	01	01	01	01	01	02	3A	80	18	71	38	2D	40	58	2C
40	45	00	40	84	63	00	00	1E	66	21	50	B0	51	00	1B	30
50	40	70	36	00	40	84	63	00	00	1E	00	00	00	FD	00	3A
60	3E	1E	53	10	00	0A	20	20	20	20	20	20	00	00	00	FC
70	00	4C	47	20	54	56	0A	20	20	20	20	20	20	20	01	E8

EDID Block 1, Bytes 128-255 [80H-FFH]

0	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	02	03	3A	F1	4E	10	9F	04	13	05	14	03	02	12	20	21
10	22	15	01	29	3D	06	C0	15	07	50	09	57	07	78	03	0C
20	00	30	00	B8	2D	20	C0	0E	01	4F	3F	FC	08	10	18	10
30	06	10	16	10	28	10	E3	05	03	01	02	3A	80	18	71	38
40	2D	40	58	2C	45	00	40	84	63	00	00	1E	01	1D	80	18
50	71	1C	16	20	58	2C	25	00	40	84	63	00	00	9E	01	1D
60	00	72	51	D0	1E	20	6E	28	55	00	40	84	63	00	00	1E
70	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	61

HDMI 4(C/S : E8 51)

EDID Block 0, Bytes 0-127 [00H-7FH]

0	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	00	FF	FF	FF	FF	FF	FF	00	1E	6D	01	00	01	01	01	01
10	01	17	01	03	80	A0	5A	78	0A	EE	91	A3	54	4C	99	26
20	0F	50	54	A1	08	00	31	40	45	40	61	40	71	40	81	80
30	01	01	01	01	01	01	02	3A	80	18	71	38	2D	40	58	2C
40	45	00	40	84	63	00	00	1E	66	21	50	B0	51	00	1B	30
50	40	70	36	00	40	84	63	00	00	1E	00	00	00	FD	00	3A
60	3E	1E	53	10	00	0A	20	20	20	20	20	20	00	00	00	FC
70	00	4C	47	20	54	56	0A	20	20	20	20	20	20	20	01	E8

EDID Block 1, Bytes 128-255 [80H-FFH]

0	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	02	03	3A	F1	4E	10	9F	04	13	05	14	03	02	12	20	21
10	22	15	01	29	3D	06	C0	15	07	50	09	57	07	78	03	0C
20	00	40	00	B8	2D	20	C0	0E	01	4F	3F	FC	08	10	18	10
30	06	10	16	10	28	10	E3	05	03	01	02	3A	80	18	71	38
40	2D	40	58	2C	45	00	40	84	63	00	00	1E	01	1D	80	18
50	71	1C	16	20	58	2C	25	00	40	84	63	00	00	9E	01	1D
60	00	72	51	D0	1E	20	6E	28	55	00	40	84	63	00	00	1E
70	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	51

4.2. White Balance Adjustment

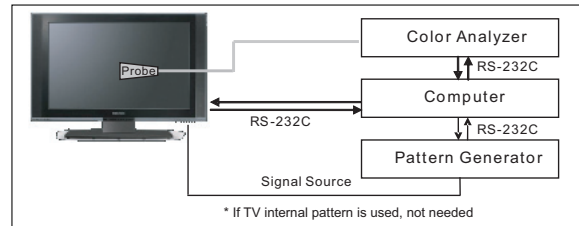
4.2.1. Overview

- W/B adj. Objective & How-it-works
 - Objective: To reduce each Panel's W/B deviation
 - How-it-works : When R/G/B gain in the OSD is at 192, it means the panel is at its Full Dynamic Range. In order to prevent saturation of Full Dynamic range and data, one of R/G/B is fixed at 192, and the other two is lowered to find the desired value.
 - Adjustment condition : normal temperature
 - Surrounding Temperature : 25 °C ± 5 °C
 - Warm-up time: About 5 Min
 - Surrounding Humidity : 20 % ~ 80 %

4.2.2. Equipment

- Color Analyzer: CA-210 (LED Module : CH 14)
 - Adjustment Computer(During auto adj., RS-232C protocol is needed)
 - Adjustment Remote control
 - Video Signal Generator MSPG-925F 720p/216-Gray (Model: 217, Pattern: 78)
 - Only when internal pattern is not available
- Color Analyzer Matrix should be calibrated using CS-100.

4.2.3. Equipment connection MAP



4.2.4. Adj. Command (Protocol)

<Command Format>

START	6E	A	50	A	LEN	A	03	A	CMD	A	00	A	VAL	A	CS	STOP
-------	----	---	----	---	-----	---	----	---	-----	---	----	---	-----	---	----	------

- LEN: Number of Data Byte to be sent
 - CMD: Command
 - VAL: FOS Data value
 - CS: Checksum of sent data
 - A: Acknowledge
- Ex) [Send: JA_00_DD] / [Ack: A_00_okDDX]

- RS-232C Command used during auto-adjustment.

RS-232C COMMAND [CMD ID DATA]			Explanation
wb	00	00	Begin White Balance adjustment
wb	00	10	Gain adjustment(internal white pattern)
wb	00	1f	Gain adjustment completed
wb	00	20	Offset adjustment(internal white pattern)
wb	00	2f	Offset adjustment completed
wb	00	ff	End White Balance adjustment (internal pattern disappears)

- Ex) wb 00 00 -> Begin white balance auto-adj.
 wb 00 10 -> Gain adj.
 ja 00 ff -> Adj. data
 jb 00 c0
 ...
 ...
 wb 00 1f → Gain adj. completed
 *(wb 00 20(Start), wb 00 2f(end)) → Off-set adj.
 wb 00 ff → End white balance auto-adj.

▪ Adj. Map

	Adj. item	Command (lower caseASCII)		Data Range (Hex.)		Default (Decimal)
		CMD1	CMD2	MIN	MAX	
Cool	R Gain	j	g	00	C0	
	G Gain	j	h	00	C0	
	B Gain	j	i	00	C0	
	R Cut					
	G Cut					
	B Cut					
Medium	R Gain	j	a	00	C0	
	G Gain	j	b	00	C0	
	B Gain	j	c	00	C0	
	R Cut					
	G Cut					
	B Cut					
Warm	R Gain	j	d	00	C0	
	G Gain	j	e	00	C0	
	B Gain	j	f	00	C0	
	R Cut					
	G Cut					

4.2.5. Adj. method

(1) Auto adj. method

- 1) Set TV in adj. mode using POWER ON key.
 - 2) Zero calibrate probe then place it on the center of the Display.
 - 3) Connect Cable.(RS-232C to USB)
 - 4) Select mode in adj. Program and begin adj.
 - 5) When adj. is complete (OK Sign), check adj. status pre mode. (Warm, Medium, Cool)
 - 6) Remove probe and RS-232C cable to complete adj.
- W/B Adj. must begin as start command "wb 00 00" , and finish as end command "wb 00 ff", and Adj. offset if need.

(2) Manual adjustment. method

- 1) Set TV in Adj. mode using POWER ON.
- 2) Zero Calibrate the probe of Color Analyzer, then place it on the center of LCD module within 10 cm of the surface.
- 3) Press ADJ key → EZ adjust using adj. R/C → 9. White-Balance then press the cursor to the right(key ►). When right key(►) is pressed 216 Gray internal pattern will be displayed
- 4) Adjust Cool modes
 - a. Fix the one of R/G/B gain to 192 (default data) and decrease the others. (If G gain is adjusted over 172 and R and B gain less than 192 , Adjust is O.K.)
 - b. If G gain is less than 172, Increase G gain by up to 172, and then increase R gain and G gain same amount of increasing G gain.
 - c. If R gain or B gain is over 255, Readjust G gain less than 172, Conform to R gain is 255 or B gain is 255
- 5) Adjust two modes(Medium/Warm) Fix the one of R/G/B gain to 192(default data) and decrease the others.
- 6) Adj. is completed, Exit adjust mode using "EXIT" key on Remote controller.

▪ If internal pattern is not available, use RF input. In EZ Adj. menu 6.White Balance, you can select one of 2 Test-pattern: ON, OFF. Default is inner(ON). By selecting OFF, you can adjust using RF signal in 206 Gray pattern.

* CASE Cool

First adjust the coordinate far away from the target value(x, y).

1. x, y > target
 - i) Decrease the R, G.
2. x, y < target
 - i) First decrease the B gain,
3. x > target, y < target
 - i) First decrease B, so make y a little more than the target.
 - ii) Adjust x value by decreasing the R
4. x < target, y > target
 - i) First decrease B, so make x a little more than the target.
 - ii) Adjust x value by decreasing the G

How to adjust

1. If G gain is adjusted over 172 and R gain and B gain less than 192 , Adjust is O.K.
2. If G gain is less than 172 , increase G gain by up to 172, and then increase R gain and B gain same amount of increasing G gain.
3. If R gain or B gain is over 255 , Readjust G gain less than 172, Conform to R gain is 255 or B gain is 255

* CASE Medium / Warm

First adjust the coordinate far away from the target value(x, y).

1. x, y > target
 - i) Decrease the R, G.
2. x, y < target
 - i) First decrease the B gain,
 - ii) Decrease the one of the others.
3. x > target, y < target
 - i) First decrease B, so make y a little more than the target.
 - ii) Adjust x value by decreasing the R
4. x < target, y > target
 - i) First decrease B, so make x a little more than the target.
 - ii) Adjust y value by decreasing the G

▪ Adjustment condition and cautionary items

- 1) Lighting condition in surrounding area
Surrounding lighting should be lower 10 lux. Try to isolate adj. area into dark surrounding.
- 2) Probe location
: Color Analyzer(CA-210) probe should be within 10 cm and perpendicular of the module surface (80° ~ 100°)
- 3) Aging time
- After Aging Start, Keep the Power ON status during 5 Minutes.
- In case of LCD, Back-light on should be checked using no signal or Full-white pattern.

4.2.6. Reference (White balance Adj. coordinate and color temperature)

- Luminance : 206 Gray
- Standard color coordinate and temperature using CS-1000 (over 26 inch)

Mode	Coordinate		Temp	Δuv
	x	y		
Cool	0.271	0.270	13000 K	0.0000
Medium	0.285	0.293	9300 K	0.0000
Warm	0.310	0.325	6500 K	0.0000

▪ Standard color coordinate and temperature using CA-210(CH 18)

Mode	Coordinate		Temp	Δuv
	x	y		
Cool	0.271±0.002	0.270±0.002	13000K	0.0000
Medium	0.285±0.002	0.293±0.002	9300K	0.0000
Warm	0.310±0.002	0.325±0.002	6500K	0.0000

4.2.7. EDGE LED White balance table

- (1) EDGE LED module change color coordinate because of aging time.
- (2) Apply under the color coordinate table, for compensated aging time.
- (3) Normal line(Edge)
- Gumi (Mar ~ Dec) & Global

GP4	Aging time (Min)	Cool		Medium		Warm	
		X	y	x	y	x	y
		271	270	285	293	313	329
1	0-2	281	287	295	310	320	342
2	3-5	280	285	294	308	319	340
3	6-9	278	284	292	307	317	339
4	10-19	276	281	290	304	315	336
5	20-35	275	277	289	300	314	332
6	36-49	274	274	288	297	313	329
7	50-79	273	272	287	295	312	327
8	80-119	272	271	286	294	311	326
9	Over 120	271	270	285	293	310	325

(4) Aging Chamber(Edge)

GP4	Aging time (Min)	Cool		Medium		Warm	
		X	y	x	y	x	y
		271	270	285	293	313	329
1	0-5	280	285	294	308	319	340
2	6-10	276	280	290	303	315	335
3	11-20	272	275	286	298	311	330
4	21-30	269	272	283	295	308	327
5	31-40	267	268	281	291	306	323
6	41-50	266	265	280	288	305	320
7	51-80	265	263	279	286	304	318
8	81-119	264	261	278	284	303	316
9	Over 120	264	260	278	283	303	315

4.3. Local Dimming Function Check

Step 1) Turn on TV.

Step 2) At the Local Dimming mode, module Edge Backlight moving right to left Back light of IOP module moving.

Step 3) Confirm the Local Dimming mode.

Step 4) Press "exit" key.



Local Dimming Demo.
(Edge LED Model)

4.4. Magic Motion Remote control test

- (1) Equipment : RF Remote control for test, IR-KEY-Code Remote control for test
- (2) You must confirm the battery power of RF-Remote control before test(recommend that change the battery per every lot)
- (3) Sequence (test)
 - 1) if you select the "Start(Mute)" key on the Adjustment remote control, you can pairing with the TV SET.
 - 2) You can check the cursor on the TV Screen, when select the "OK" key on the Adjustment remote control.
 - 3) You must remove the pairing with the TV Set by select "OK" key + "Mute" key on the Adjustment remote control for 5 seconds.

4.5. 3D function test

(Pattern Generator MSHG-600, MSPG-6100[Support HDMI1.4])

* HDMI mode NO. 872 , pattern No.83

- (1) Please input 3D test pattern like below.



- (2) When 3D OSD appear automatically, then select OK key.



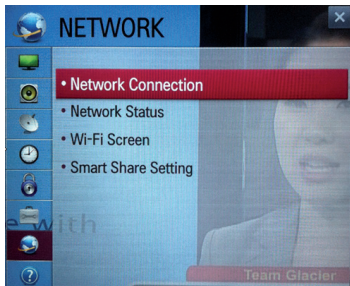
- (3) Don't wear a 3D Glasses, check the picture like below.



4.6. Wi-Fi Test

Step 1) Turn on TV

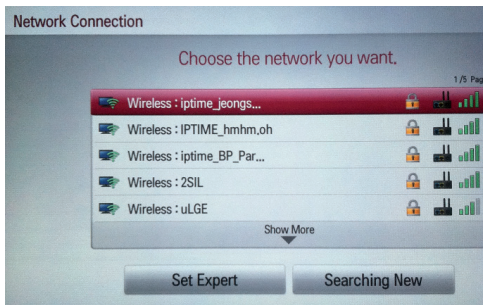
Step 2) Select Network Connection option in Network Menu.



Step 3) Select Start Connection button in Network Connection.



Step 4) If the system finds any AP like blow PIC, it is working well.



4.7. LNB voltage and 22KHz tone check

(only for DVB-S/S2 model)

▪ Test method

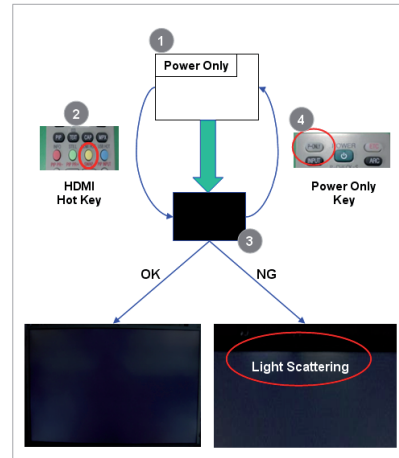
- (1) Set TV in Adj. mode using POWER ON.
- (2) Connect cable between satellite ANT and test JIG.
- (3) Press Yellow key(ETC+SWAP) in Adj Remote control to make LNB on.
- (4) Check LED light 'ON' at 18 V menu.
- (5) Check LED light 'ON' at 22 KHz tone menu.
- (6) Press Blue key(ETC+PIP INPUT) in Adjustment Remote control to make LNB off.
- (7) Check LED light 'OFF' at 18 V menu.
- (8) Check LED light 'OFF' at 22 KHz tone menu.

▪ Test result

- (1) After press LNB On key, '18 V LED' and '22 KHz tone LED' should be ON.
- (2) After press LNB OFF key, '18 V LED' and '22 KHz tone LED' should be OFF.

4.8. Inspection of light scattering

▪ Test Method



- (1) Push "Power only" key.
- (2) Push "HDMI" hot key.
- (3) Inspect whether light scattering is occurred in internal black pattern or not.
- (4) Push "Power only" key.

4.9. Option selection per country

4.9.1. Overview

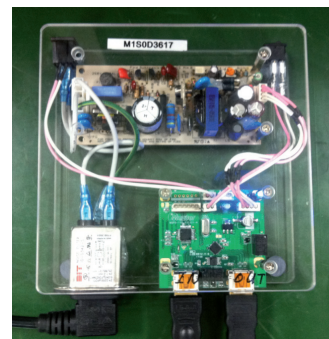
- Option selection is only done for models in Non-EU.

4.9.2. Method

- (1) Press ADJ key on the Adjustment Remote Control, then select Country Group Menu
- (2) Depending on destination, select Country Group Code 04 or Country Group EU then on the lower Country option, select US, CA, MX. Selection is done using +, - or ►◄ key.

4.10. MHL Test

- (1) Turn on TV
- (2) Select HDMI4 mode using input Menu.
- (3) Set MHL Zig(M1S0D3617) using MHL input, output and power cord.
- (4) Connect HDMI cable between MHL Zig and HDMI4 port.
- (5) Check LED light of Zig and Module of Set.



Result) If, the LED light is green and the Module shows normal stream → OK, Else → NG

4.11. HDMI ARC Function Inspection

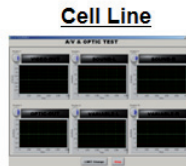
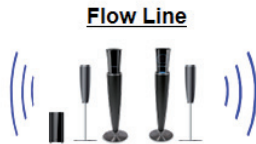
- (1) Test equipment
 - Optic Receiver Speaker
 - MSHG-600 (SW: 1220 ↑)
 - HDMI Cable (for 1.4 version)
- (2) Test method
 - 1) Insert the HDMI Cable to the HDMI ARC port from the master equipment (HDMI1)



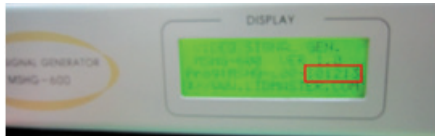
- 2) Check the sound from the TV Set



- 3) Check the Sound from the Speaker or using AV & Optic TEST program (It's connected to MSHG-600)

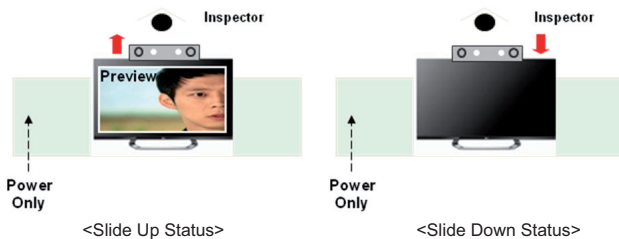


* Remark: Inspect in Power Only Mode and check SW version in a master equipment



4.12. Camera Function Inspection

- (1) Objective : To check how it connects between Camera and PCBA normally, and their Function
- (2) Test Method : This Inspection is available only Power-Only Status.
 - 1) Slide Camera Up.
 - 2) Camera's Preview picture appears on TV Set.
 - 3) Slide Camera Down.



4.13. Ship-out mode check(In-stop)

- After final inspection, press "IN-STOP" key of the Adjustment remote control and check that the unit goes to Stand-by mode.

4.14. Tool Option selection

- Method: Press ADJ key on the Adj. R/C, then select Tool option.

4.15. GND and Internal Pressure check

4.15.1. Method

- (1) GND & Internal Pressure auto-check preparation
 - Check that Power cord is fully inserted to the SET. (If loose, re-insert)
- (2) Perform GND & Internal Pressure auto-check
 - Unit fully inserted Power cord, Antenna cable and A/V arrive to the auto-check process.
 - Connect D-terminal to AV JACK TESTER
 - Auto CONTROLLER(GWS103-4) ON
 - Perform GND TEST
 - If NG, Buzzer will sound to inform the operator.
 - If OK, changeover to I/P check automatically. (Remove CORD, A/V form AV JACK BOX.)
 - Perform I/P test
 - If NG, Buzzer will sound to inform the operator.
 - If OK, Good lamp will lit up and the stopper will allow the pallet to move on to next process.

4.15.2. Checkpoint

- TEST voltage
 - GND: 1.5 KV / min at 100 mA
 - SIGNAL: 3 KV / min at 100 mA
- TEST time: 1 second
- TEST POINT
 - GND TEST = POWER CORD GND & SIGNAL CABLE METAL GND
 - Internal Pressure TEST = POWER CORD GND & LIVE & NEUTRAL
- LEAKAGE CURRENT: At 0.5 mArms

5. Audio

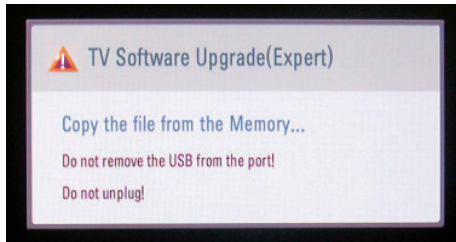
No.	Item	Min	Typ	Max	Unit	Remark
1.	Audio practical max Output, L/R (Distortion=10% max Output)	9.0	10.0	12.0	W	Measurement condition Auto Volume : Off Audio EQ : Off Clear Voice : Off Virtual Surround: Off
		8.5	8.9	9.8	Vrms	
2.	Speaker (8 Ω Impedance)		10.0	15.0	W	

Measurement condition:

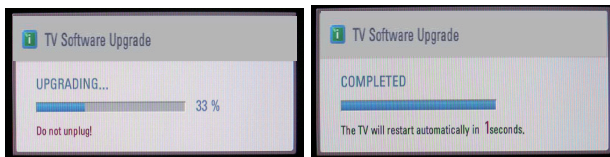
- (1) RF input: Mono, 1 KHz sine wave signal, 100 % Modulation
- (2) CVBS, Component: 1 KHz sine wave signal 0.5 Vrms
- (3) RGB PC: 1 KHz sine wave signal 0.7 Vrms

6. USB S/W Download(Service only)

- (1) Put the USB Stick to the USB socket.
- (2) Automatically detecting update file in USB Stick.
 - If your downloaded program version in USB Stick is Low, it didn't work. But your downloaded version is High, USB data is automatically detecting.(Download Version High & Power only mode, Set is automatically Download)
- (3) Show the message "Copying files from memory".



- (4) Updating is starting.

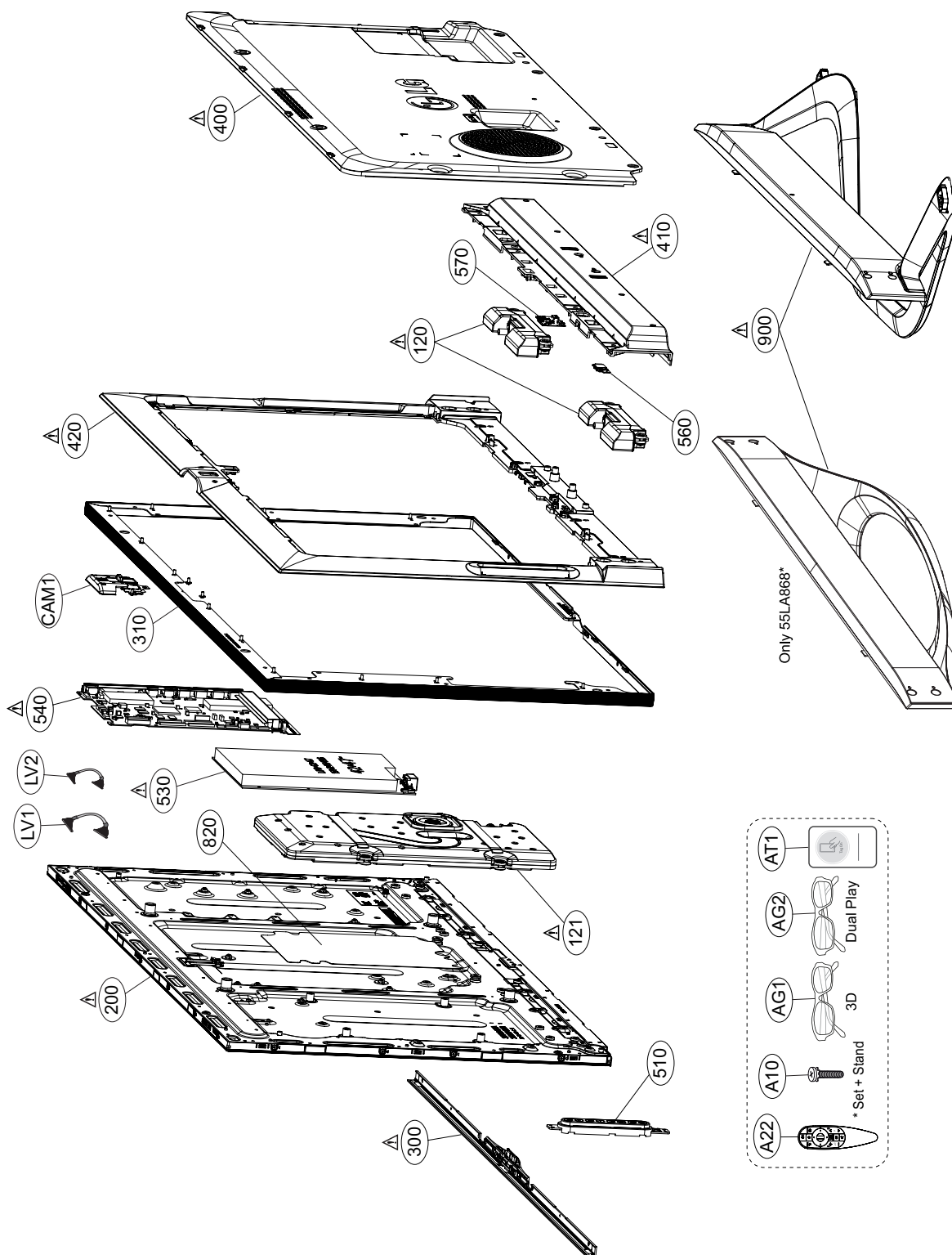


- (5) Updating Completed, The TV will restart automatically.
 - (6) If your TV is turned on, check your updated version and Tool option. (explain the Tool option, next stage)
- * If downloading version is more high than your TV have, TV can lost all channel data. In this case, you have to channel recover. if all channel data is cleared, you didn't have a DTV/ ATV test on production line.
- * After downloading, have to adjust Tool Option again.
- (1) Push "IN-START" key in service remote control.
 - (2) Select "Tool Option 1" and push "OK" key.
 - (3) Punch in the number. (Each model has their number)

EXPLODED VIEW

IMPORTANT SAFETY NOTICE

Many electrical and mechanical parts in this chassis have special safety-related characteristics. These parts are identified by Δ in the Schematic Diagram and EXPLODED VIEW. It is essential that these special safety parts should be replaced with the same components as recommended in this manual to prevent X-RADIATION, Shock, Fire, or other Hazards. Do not modify the original design without permission of manufacturer.



Clock for LG1154D

MAIN Clock(24MHz)

System Clock for Analog block(24MHz)

[illegible][illegible]

```
*01* : CPU(1056Mhz),M0 / M1 DDR(672,672 Mhz)
*10* : CPU(1056Mhz),M0 / M1 DDR(792,792 Mhz)
*11* : CPU( 960Mhz),M0 / M1 DDR(792,792 Mhz)
```

```

-00- : Normal Mode
*01/10/11* : Internal Test mode

```

+3.3V_NORMAL
 10k
 3.3k
 INSTANT boot MODE
 *1 : Instant boot
 *0 : normal
 (internal pull down)
 INSTANT_BOOT
 INSTANT_MODE0

BOOT MODE
*0 : EMHC
*1 : TEST MODE

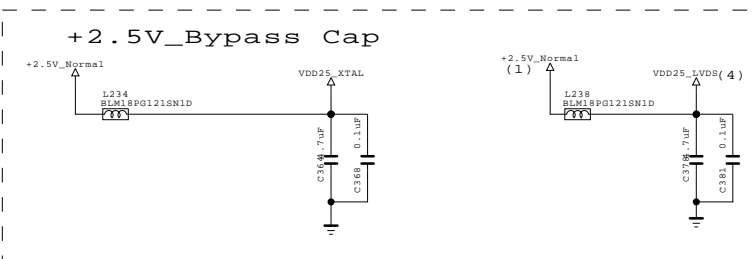
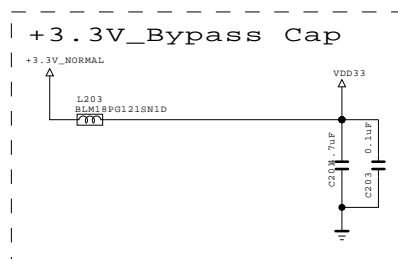
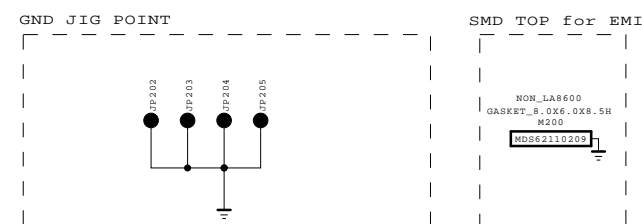
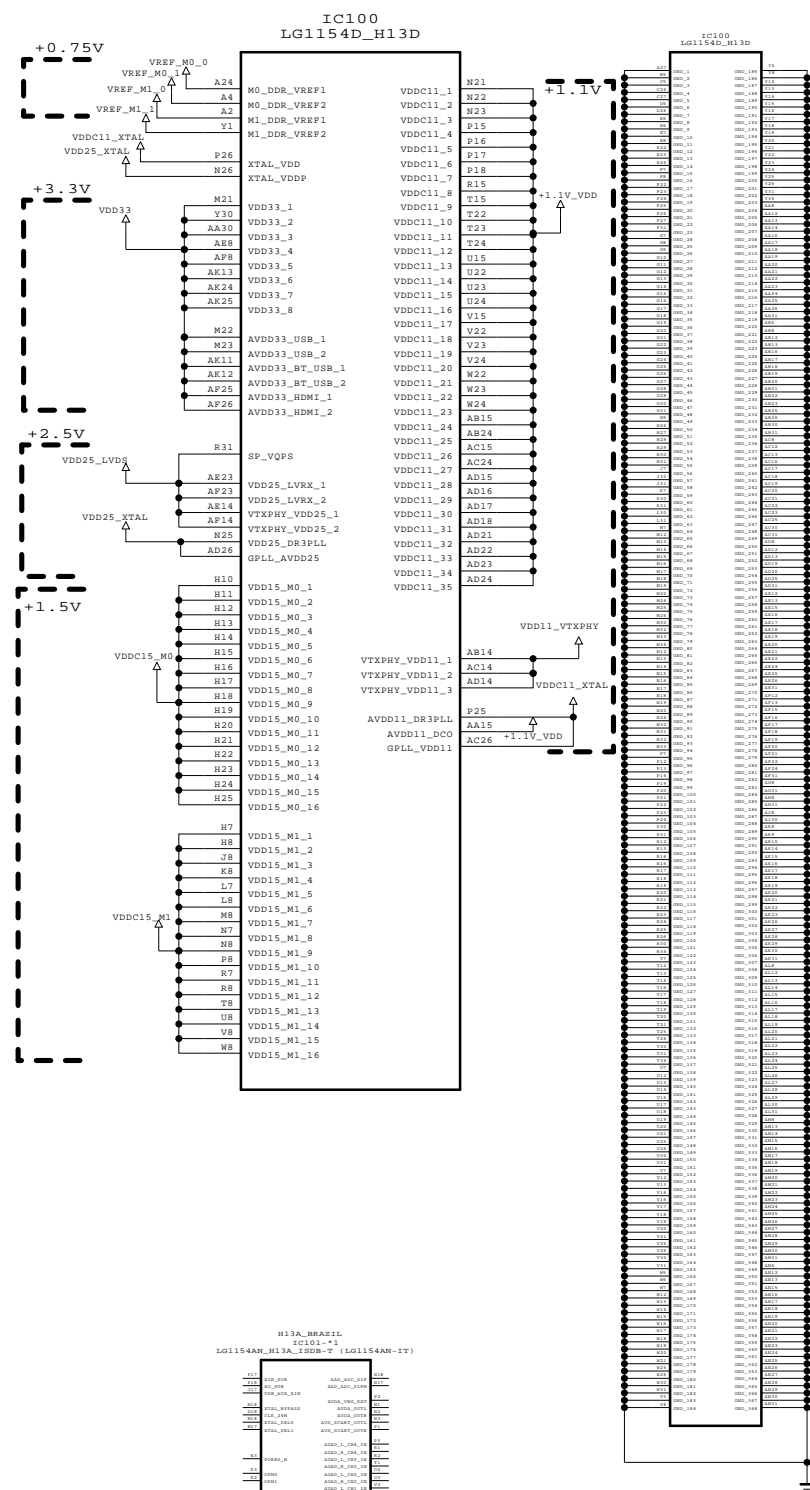
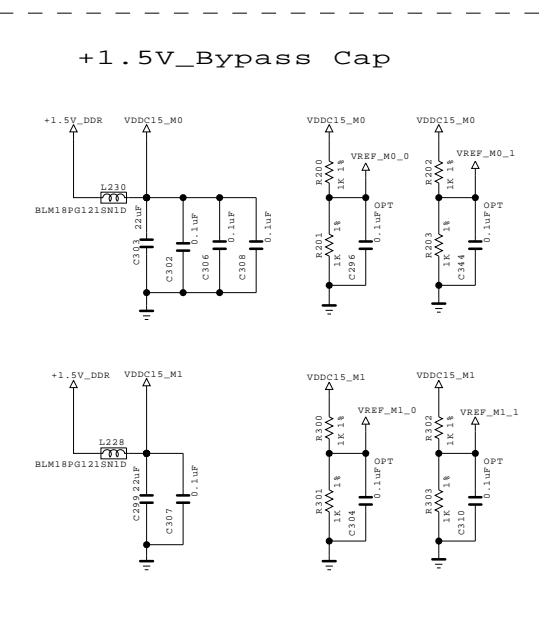
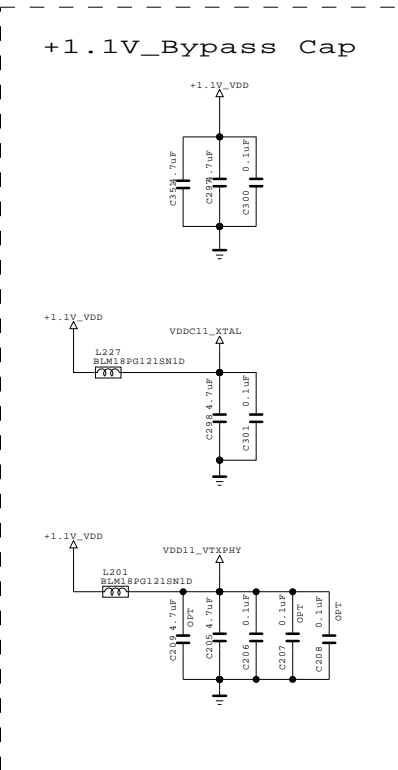
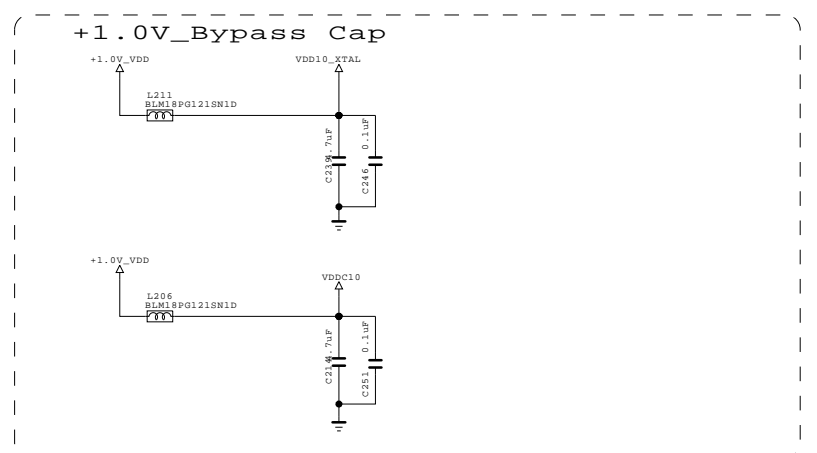
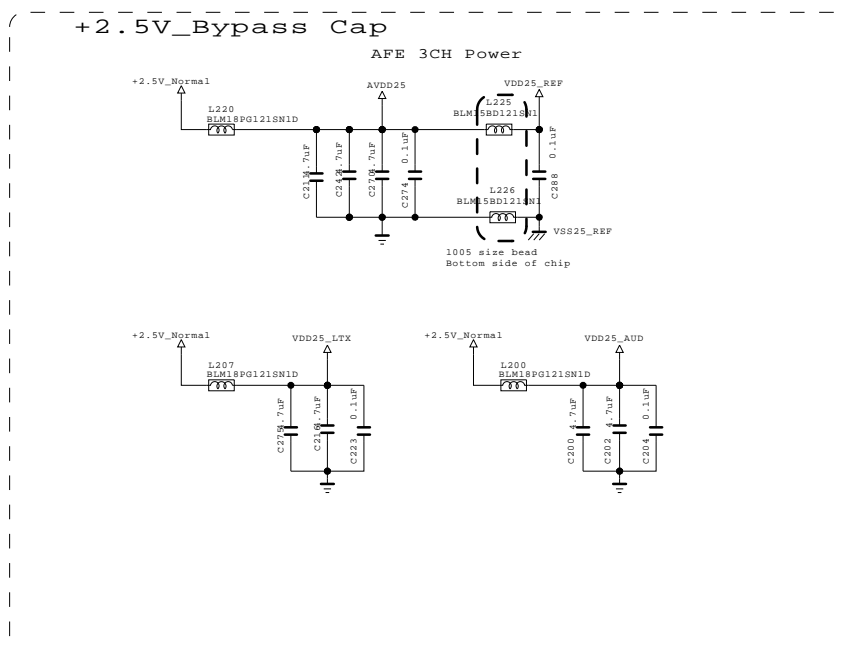
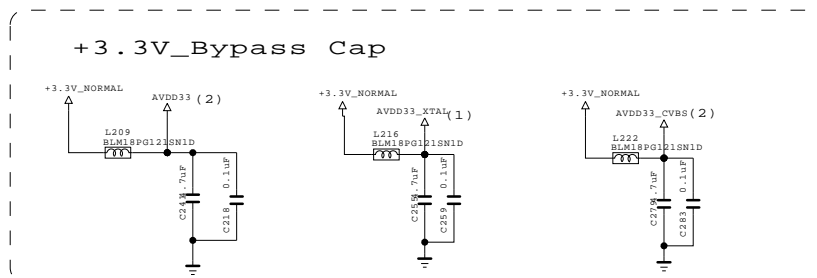
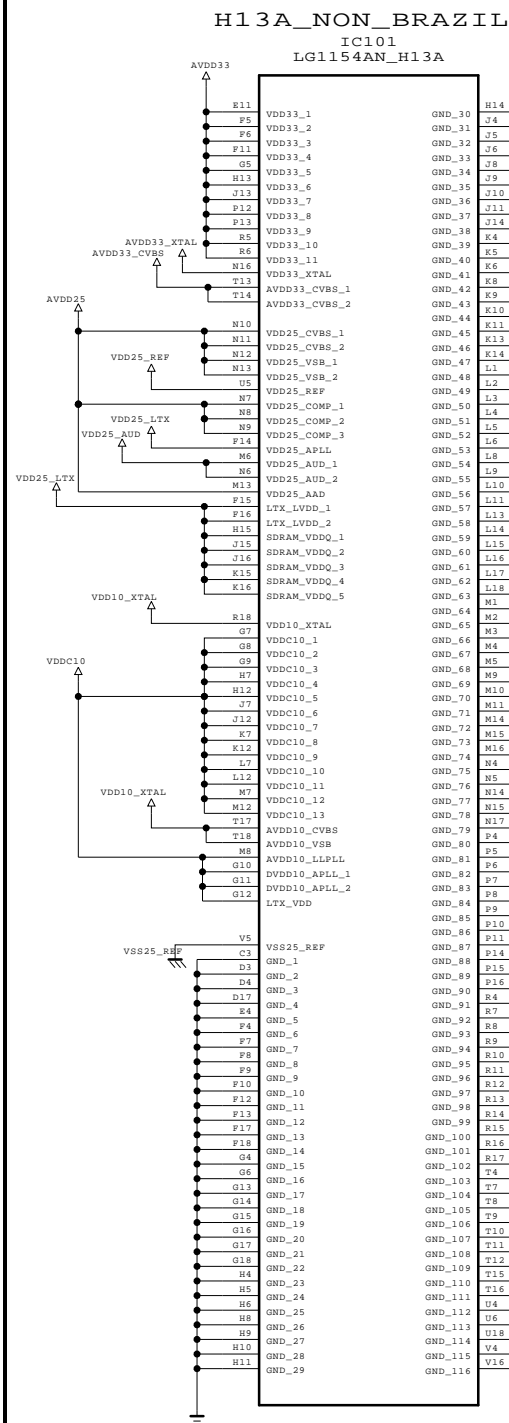
BOOT_MODE0



[illegible]

The diagram shows the P101 12507MS-04L debugger connected to the microcontroller's UART2 pins. The debugger's pin 1 is connected to the +3.3V_NORMAL supply via a 10kΩ resistor. The debugger's pin 2 is connected to the UART2_RX pin. The debugger's pin 3 is connected to ground. The debugger's pin 4 is connected to the UART2_TX pin. The debugger's pin 5 is connected to ground.

SECRET
Electronics

MODEL		DATE	2012-11-14
BLOCK	H13 D CHIP	SHEET	/



THE  SYMBOL MARK OF THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFACTURES SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE  SYMBOL MARK OF THE SCHEMATIC.

SECRET
Electronic

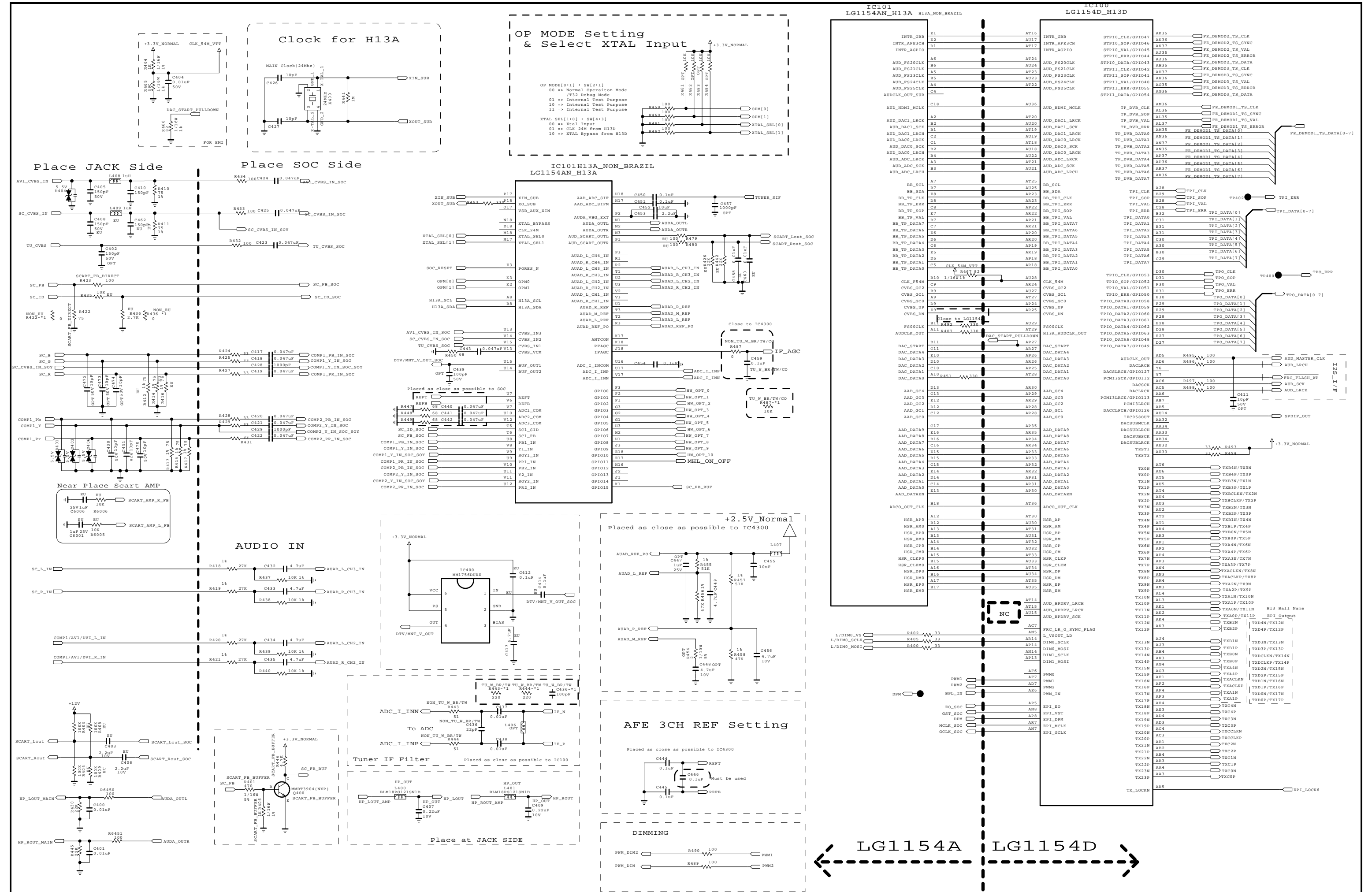
BSD-NC4_H002-HD

MODEL
BLOCK

MAIN POWER

DATE
SHEET

2012-12-24



THE SYMBOL MARK OF THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILTRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFACTURES SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE SYMBOL MARK OF THE SCHEMATIC.

SECRET
LGElectronics

LG ELECTRONICS

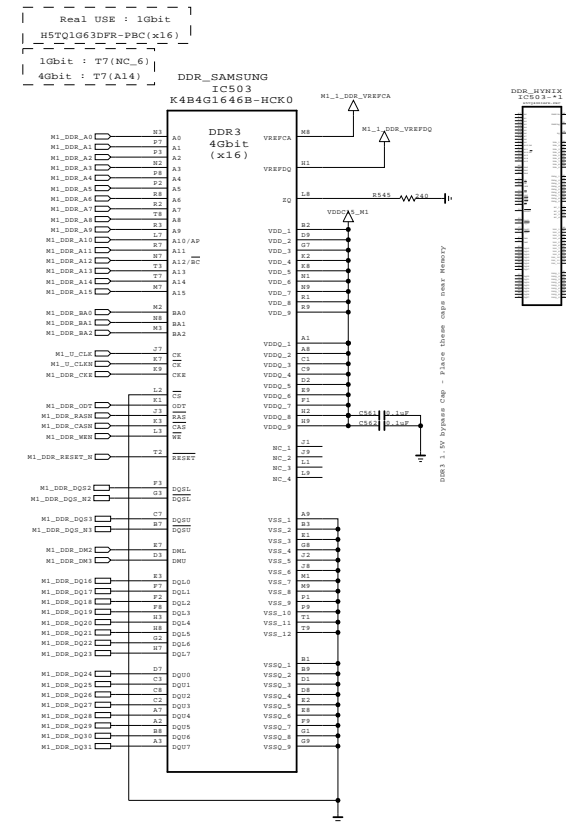
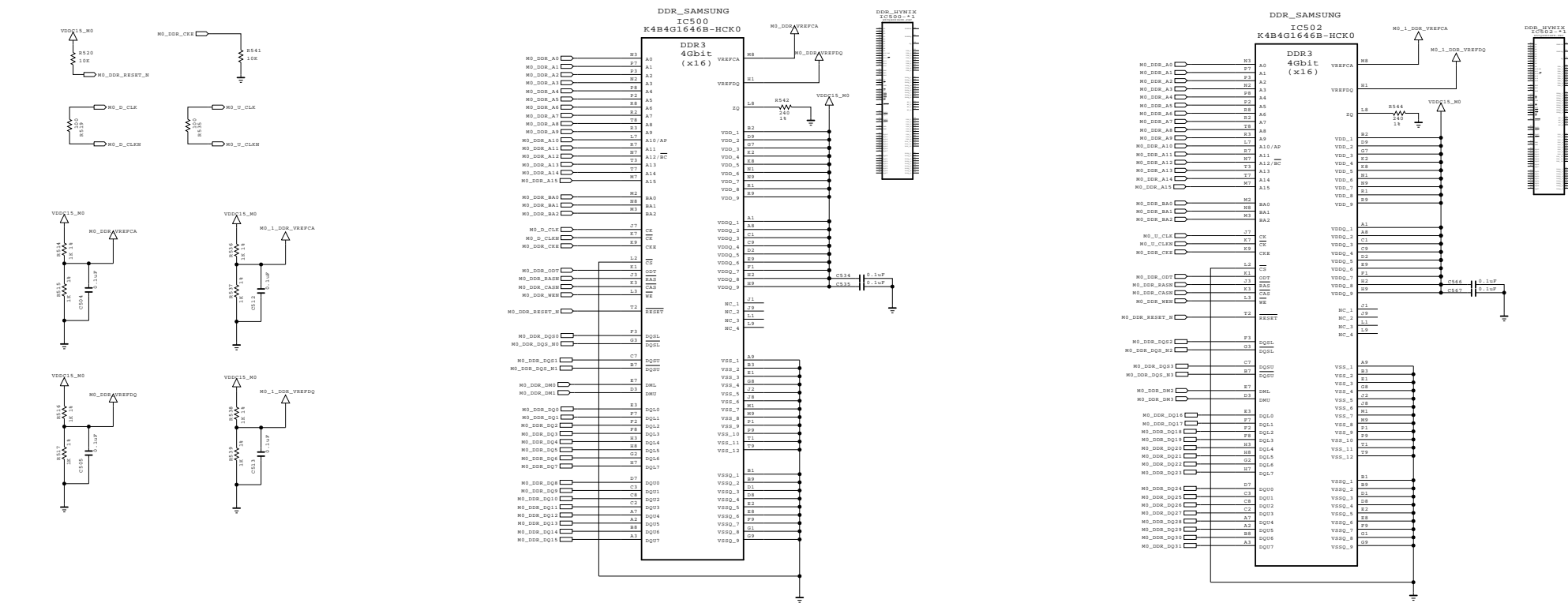
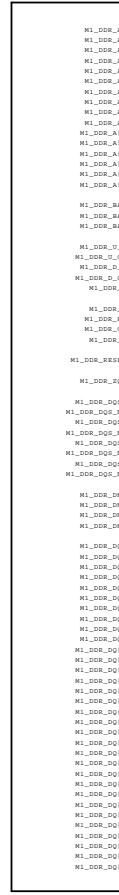
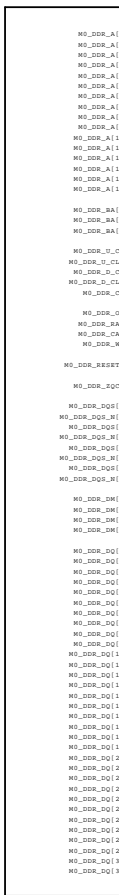
MODEL
BLOCK

MAIN AUDIO/VIDEO

DATE
SHEET

2012-11-13

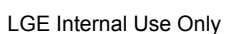
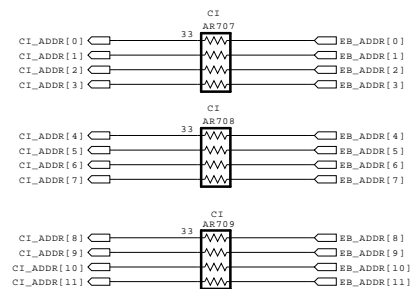
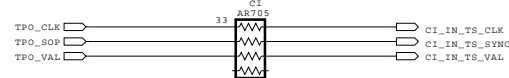
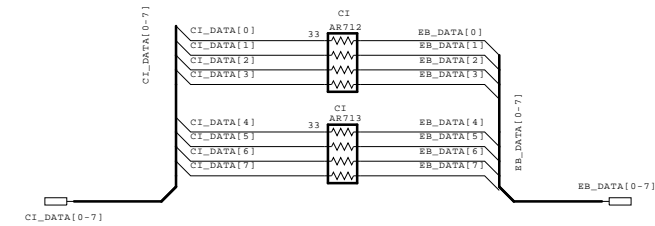
BSD-NC4_H004-HD

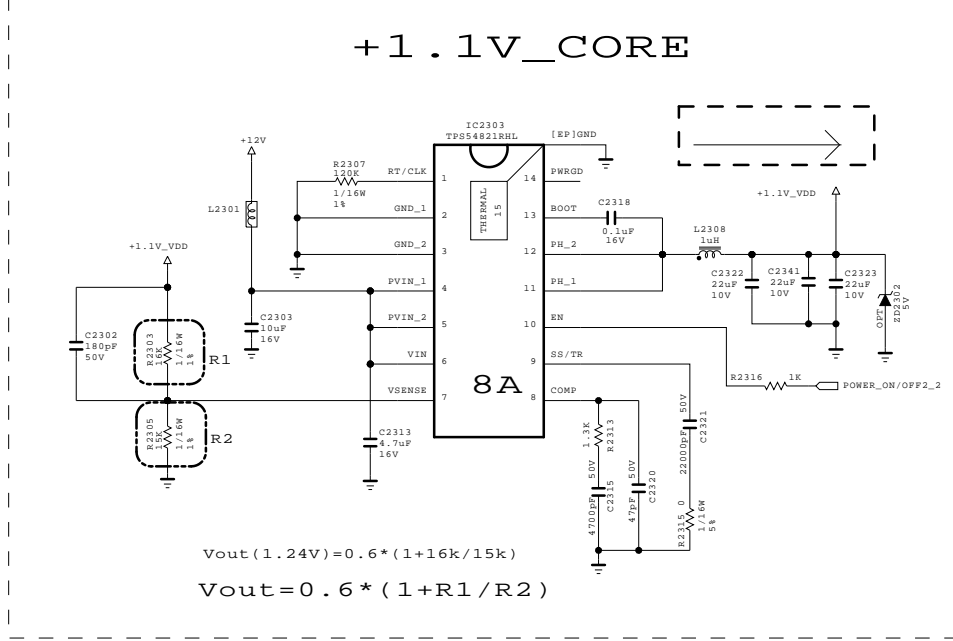
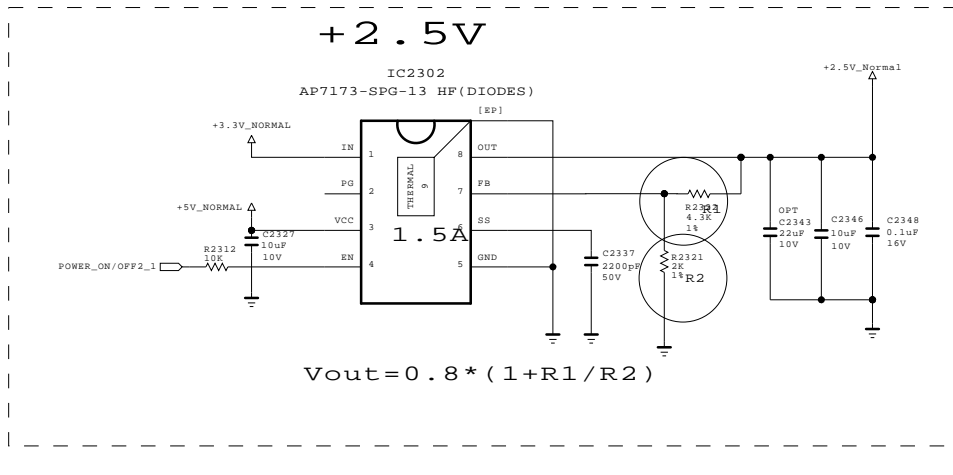
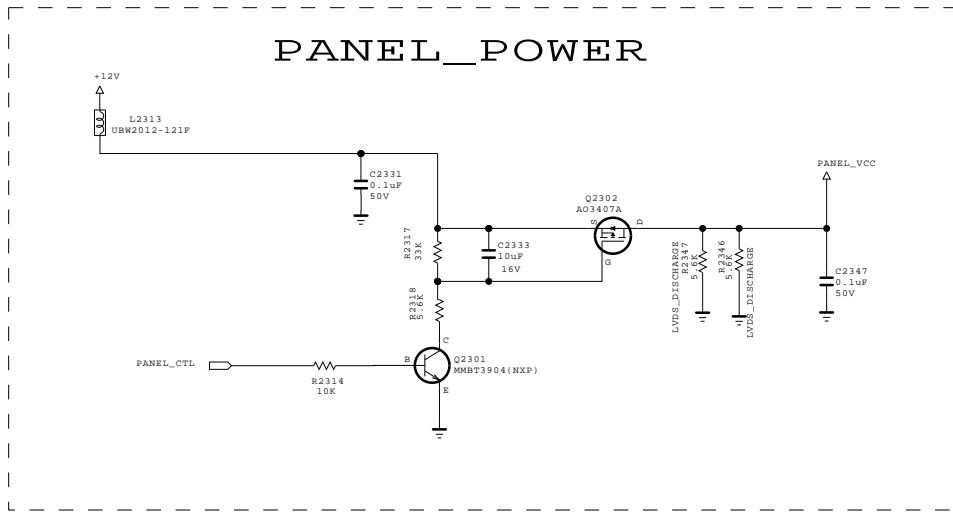
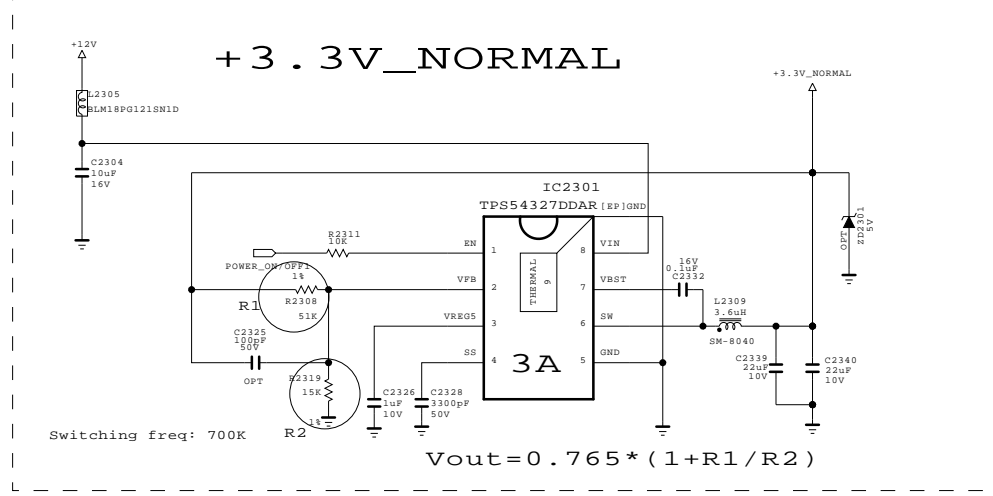
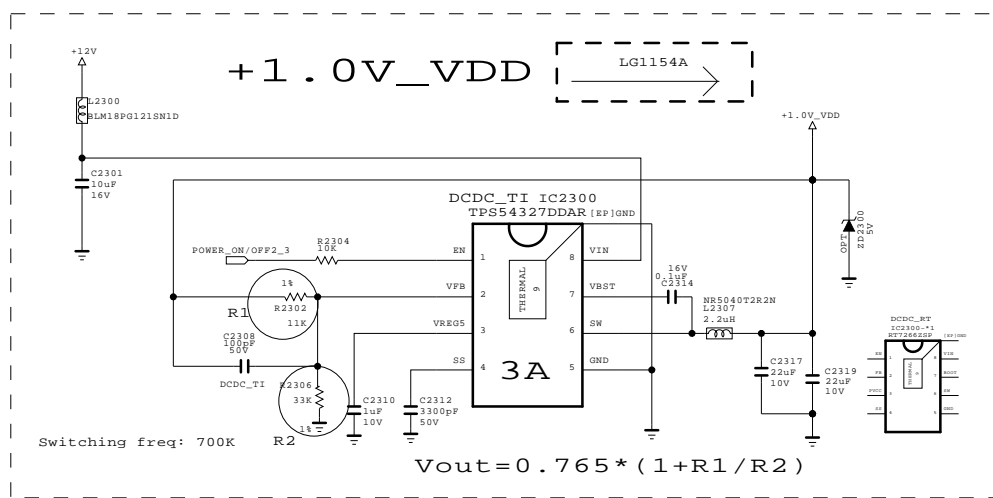
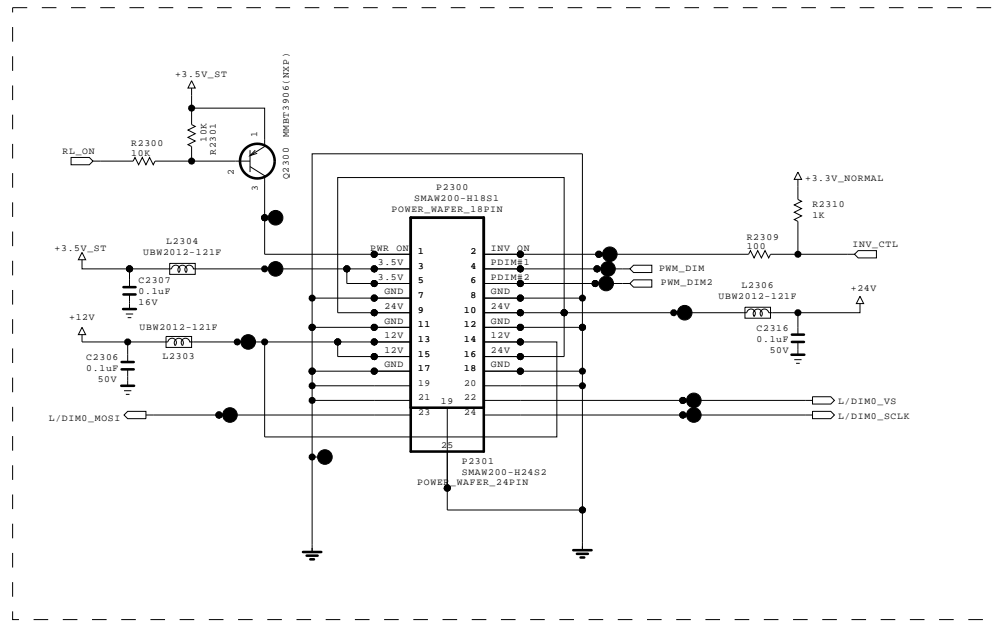


SECRET
LGElectronics



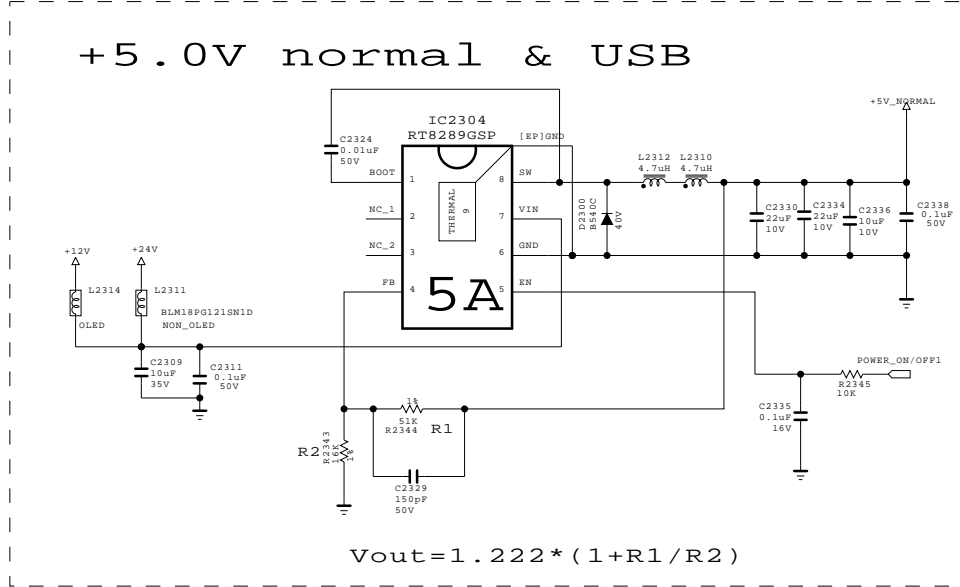
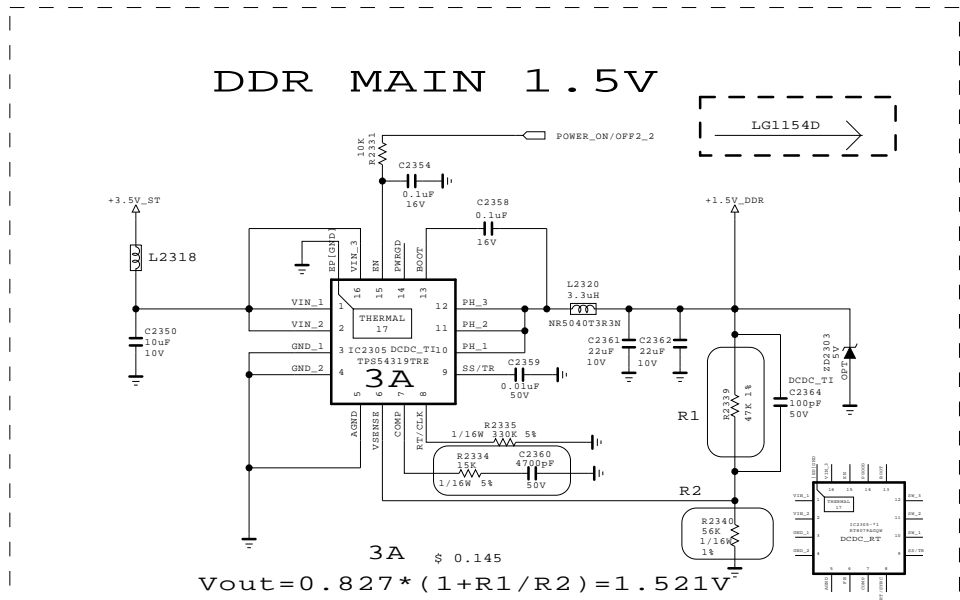
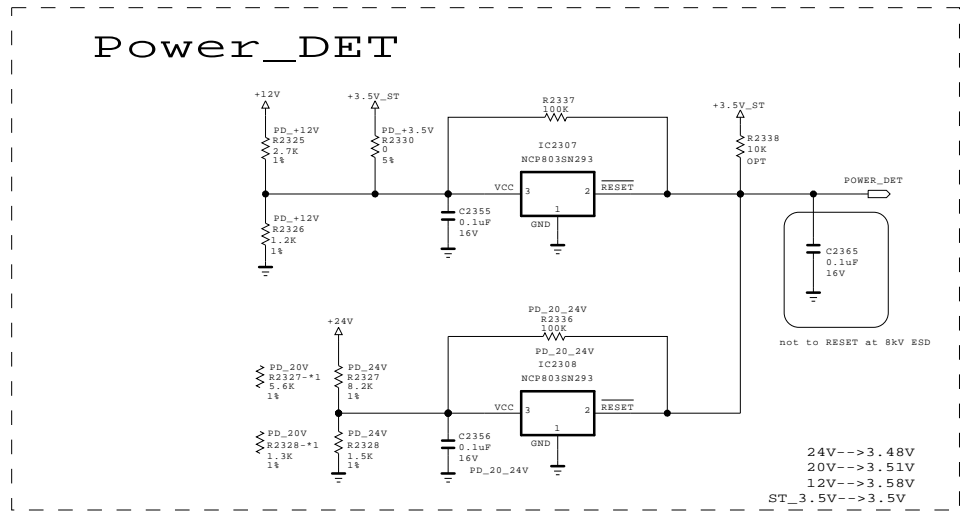
MODEL		DATE	2012-09-14
BLOCK	MAIN DDR	SHEET	/





POWER UP SEQUENCE

5V/3.3V->2.5V->1.5V/1.1V->1.0V
 LG1154D : 3.3V->2.5V->1.5V->1.1V
 LG1154AN : 3.3V->2.5V->1.0V



THE SYMBOL MARK OF THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFACTURES SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE SYMBOL MARK OF THE SCHEMATIC.

SECRET
 LGElectronics

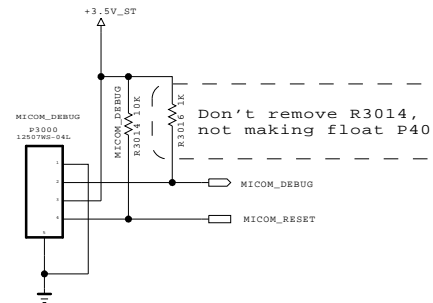
LG ELECTRONICS

MODEL	LG1154	DATE	2012-12-07
BLOCK	POWER	SHEET	/

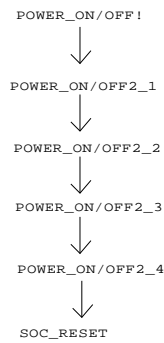
BSD-NC4_H023-HD

Renesas MICOM

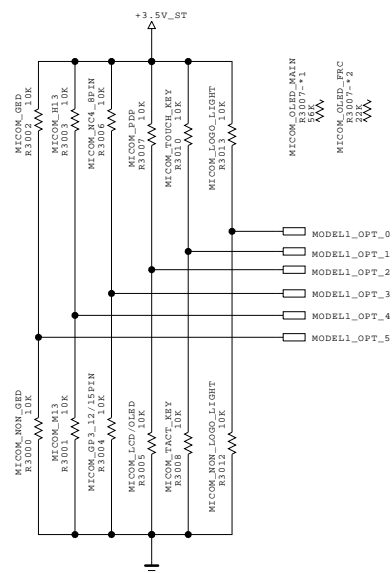
For Debug



GP4 High/MID Power SEQUENCE

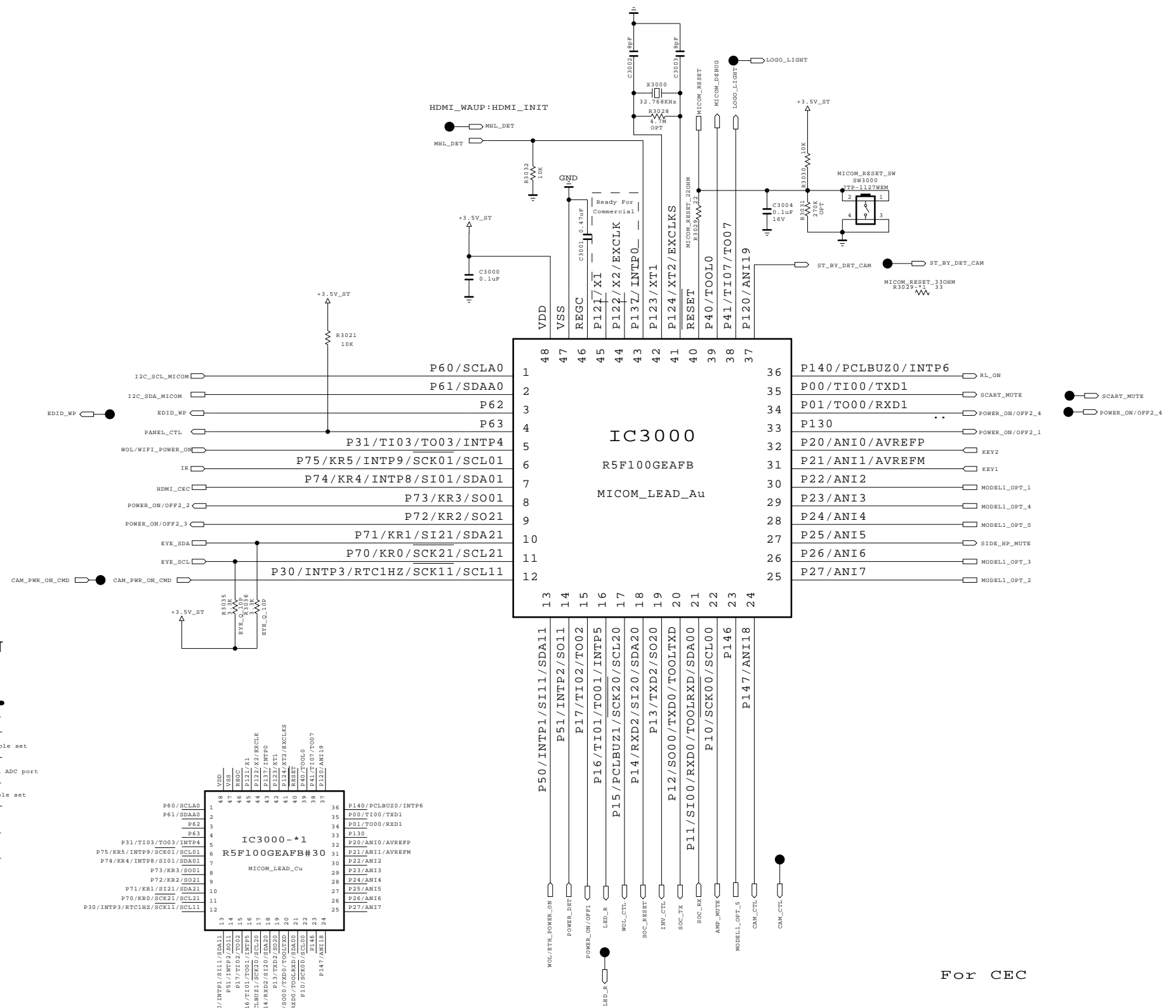


MICOM MODEL OPTION

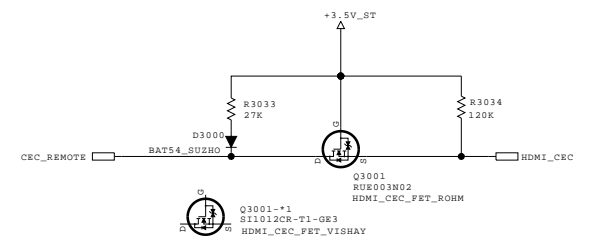


MICOM MODEL OPTION

	0	1	
MODEL_OPT_0	NON LOGO	LOGO	For LOGO LIGHT
MODEL_OPT_1	TACT_KEY	TOUCH_KEY	Ready for sample set
MODEL_OPT_2	LCD / OLED	PDP	Need to Assign ADC port
MODEL_OPT_3	IR_wafer(12/15)	IR_wafer(10pin)	Ready for sample set
MODEL_OPT_4	M13	H13	
MODEL_OPT_5	NON_GED	GED	



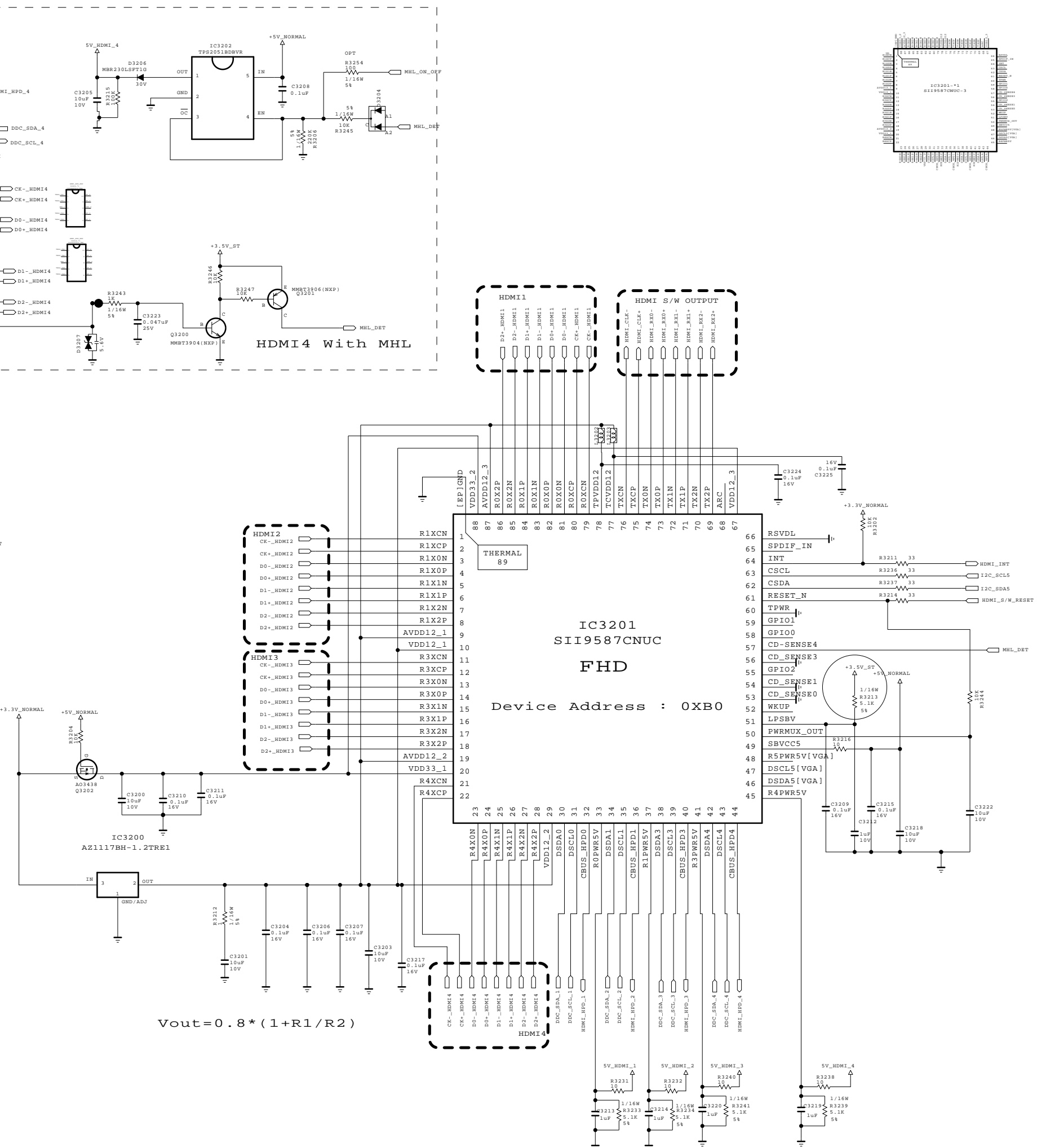
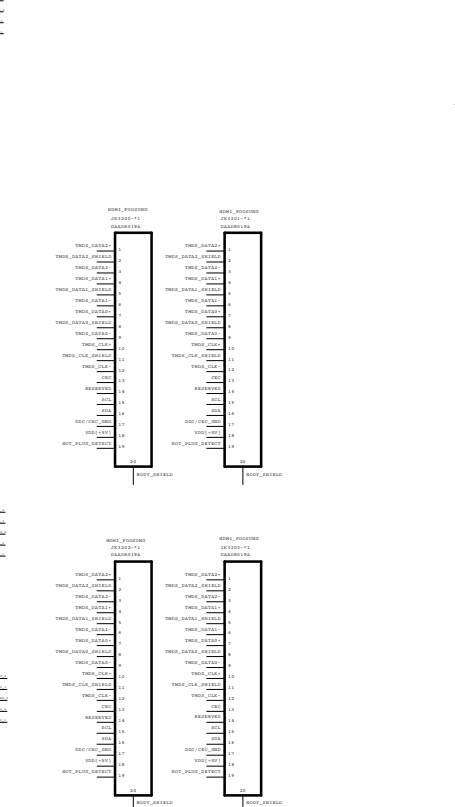
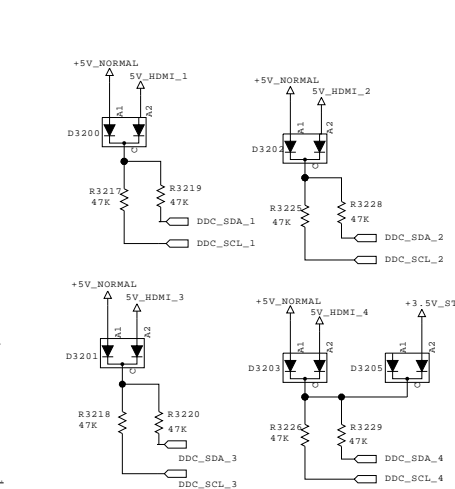
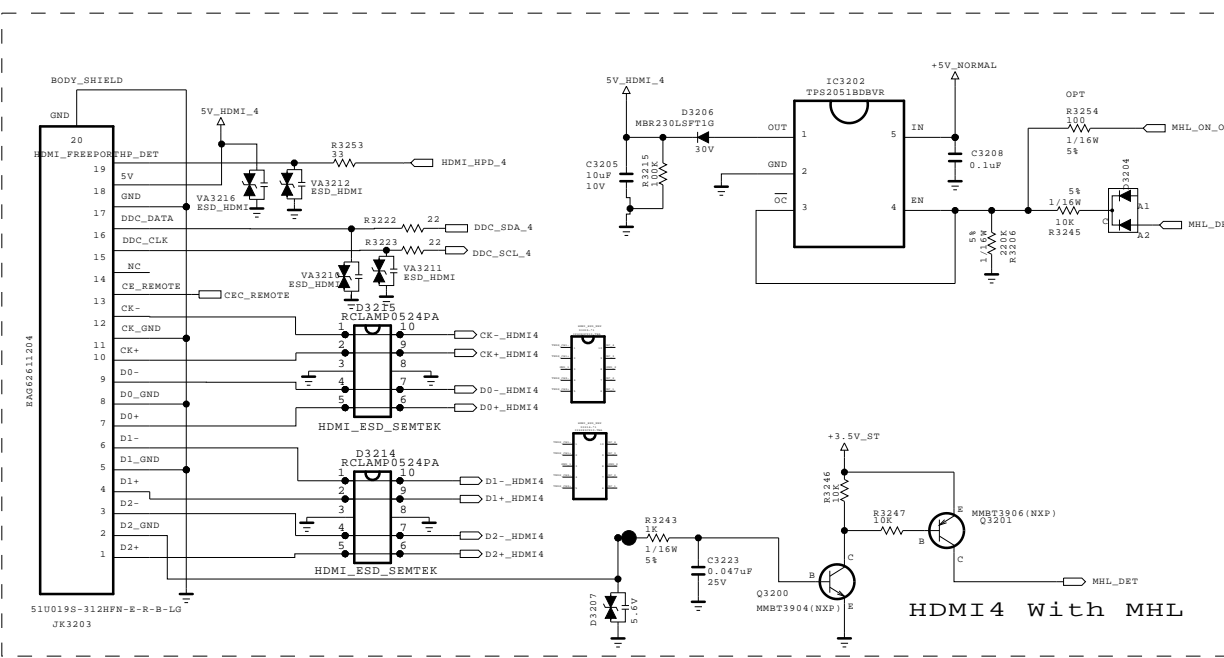
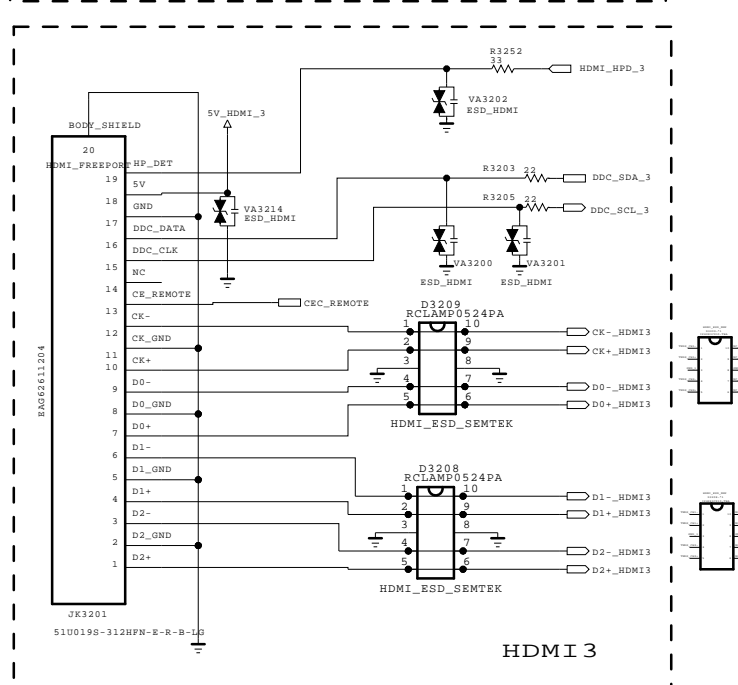
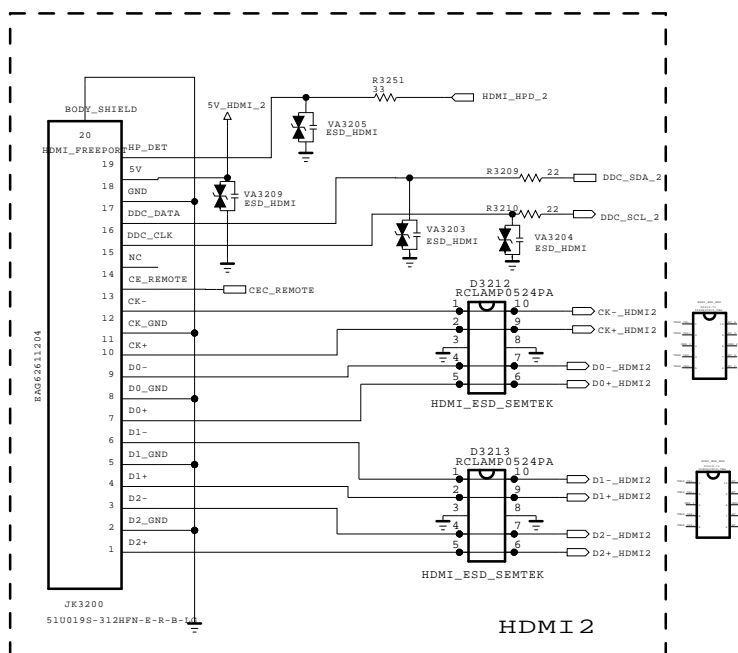
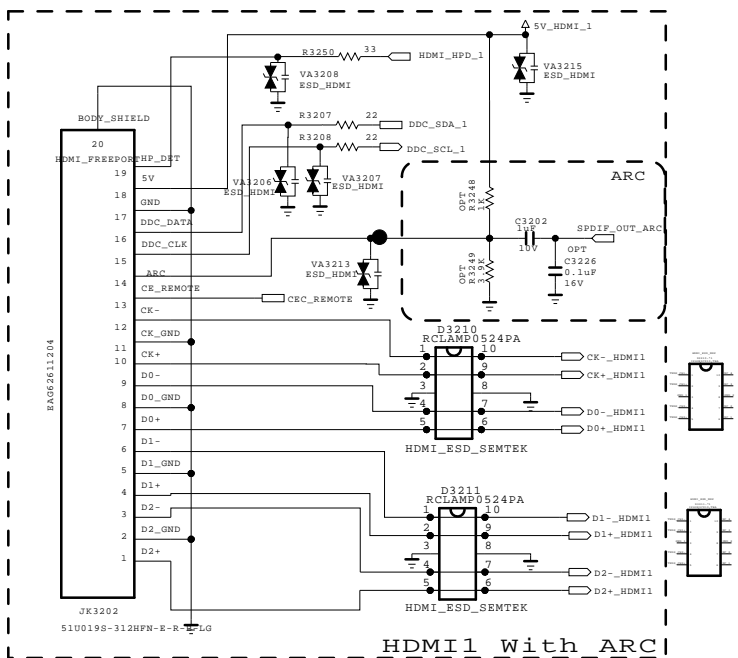
For CEC





THE ⚠ SYMBOL MARK OF THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFACTURES SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE ⚠ SYMBOL MARK OF THE SCHEMATIC.

SECRET
G Electronics

MODEL		DATE	2012.02.22
BLOCK	MICOM	SHEET	30 /

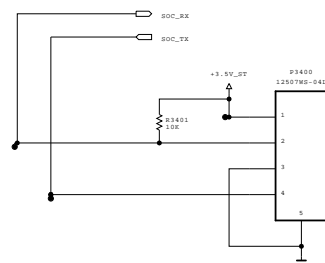
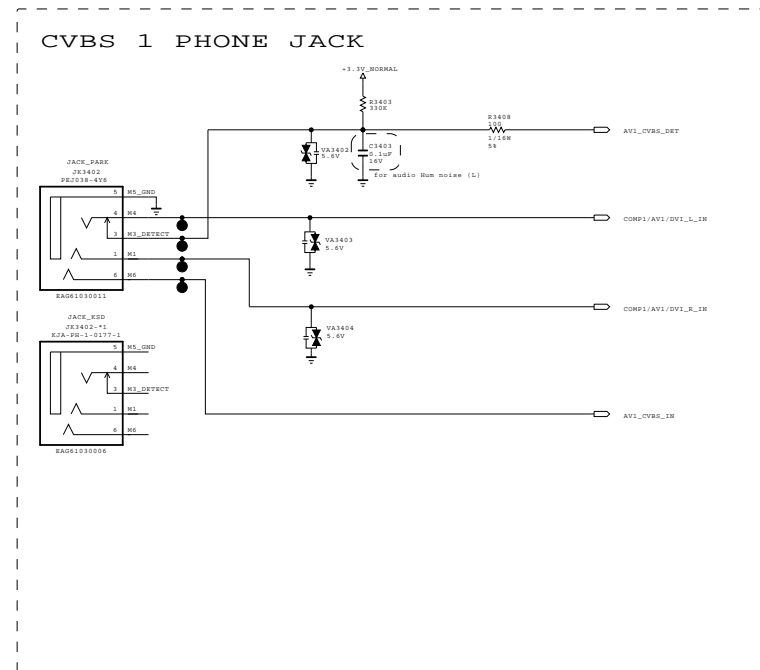
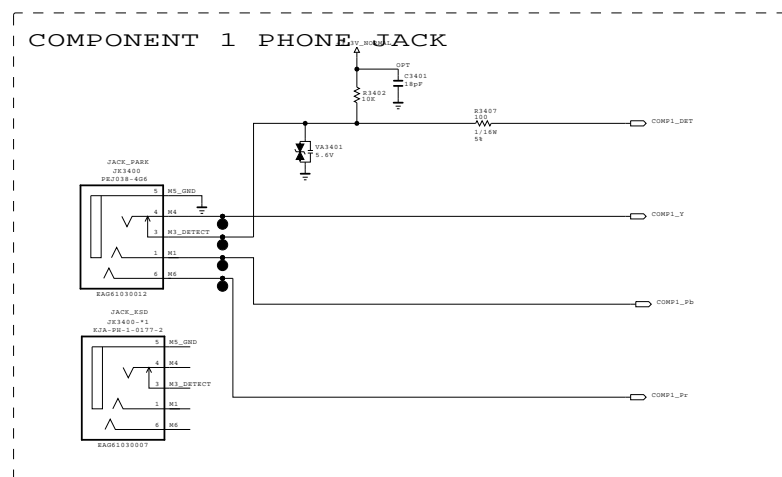
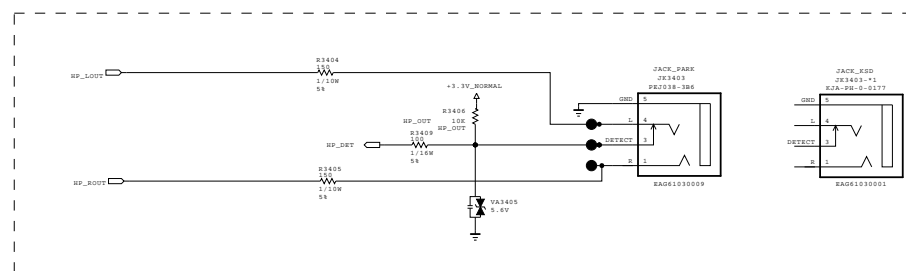
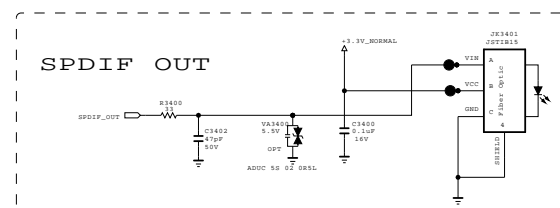




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SECRET
LGElectronics



MODEL	GP 4	DATE	
BLOCK	HDMI	SHEET	32 /

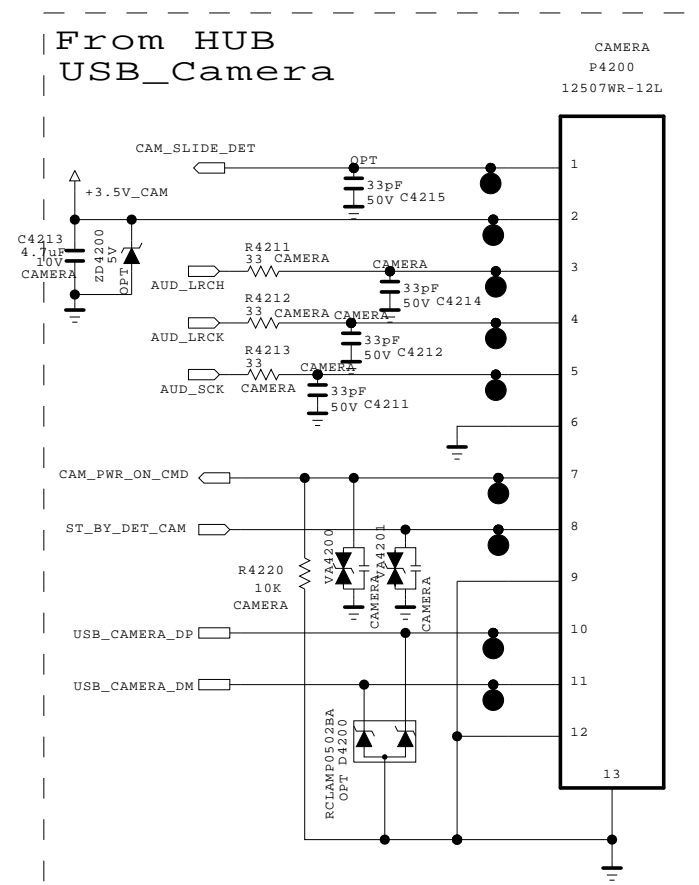
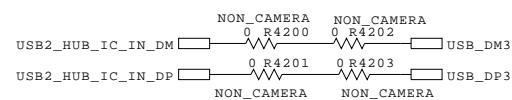


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SECRET
LGElectronics



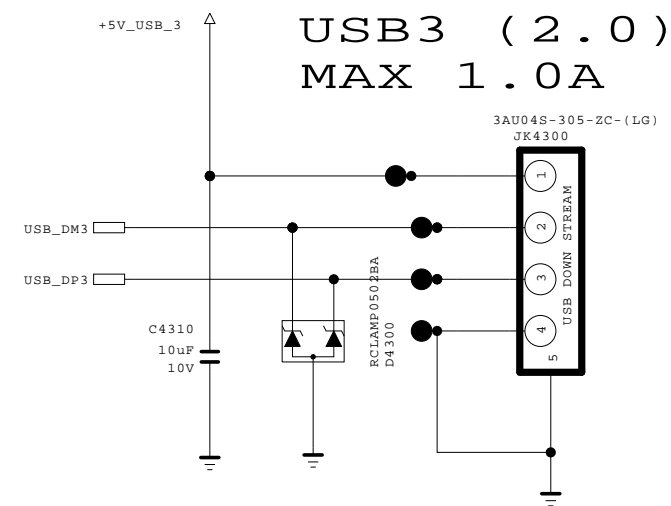
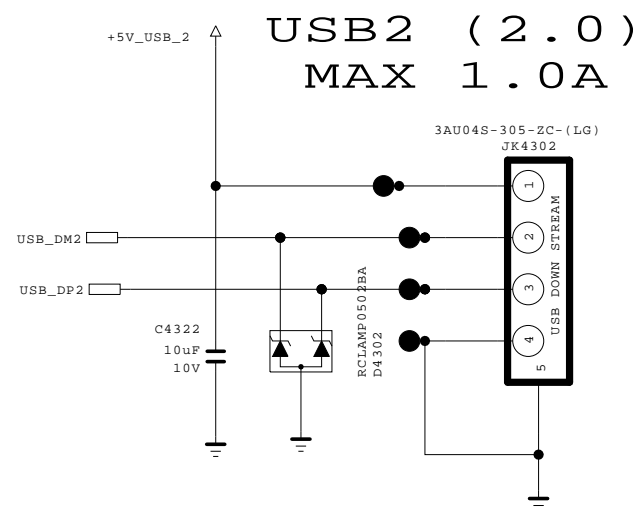
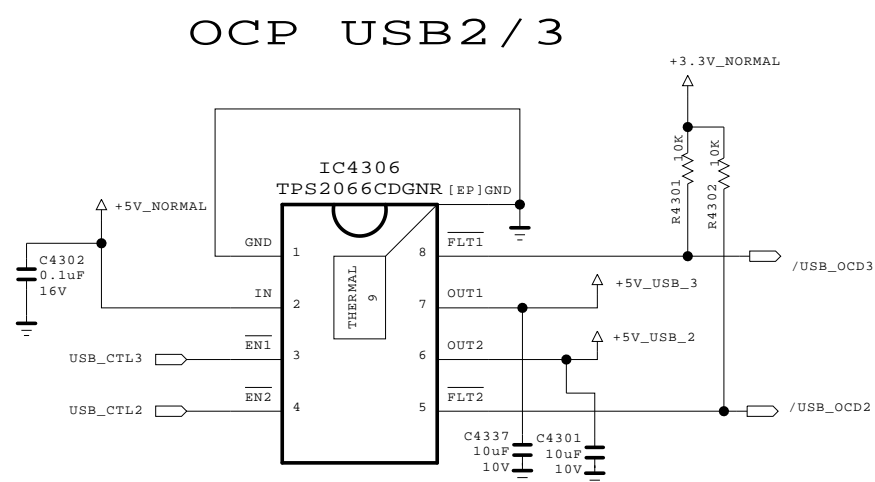
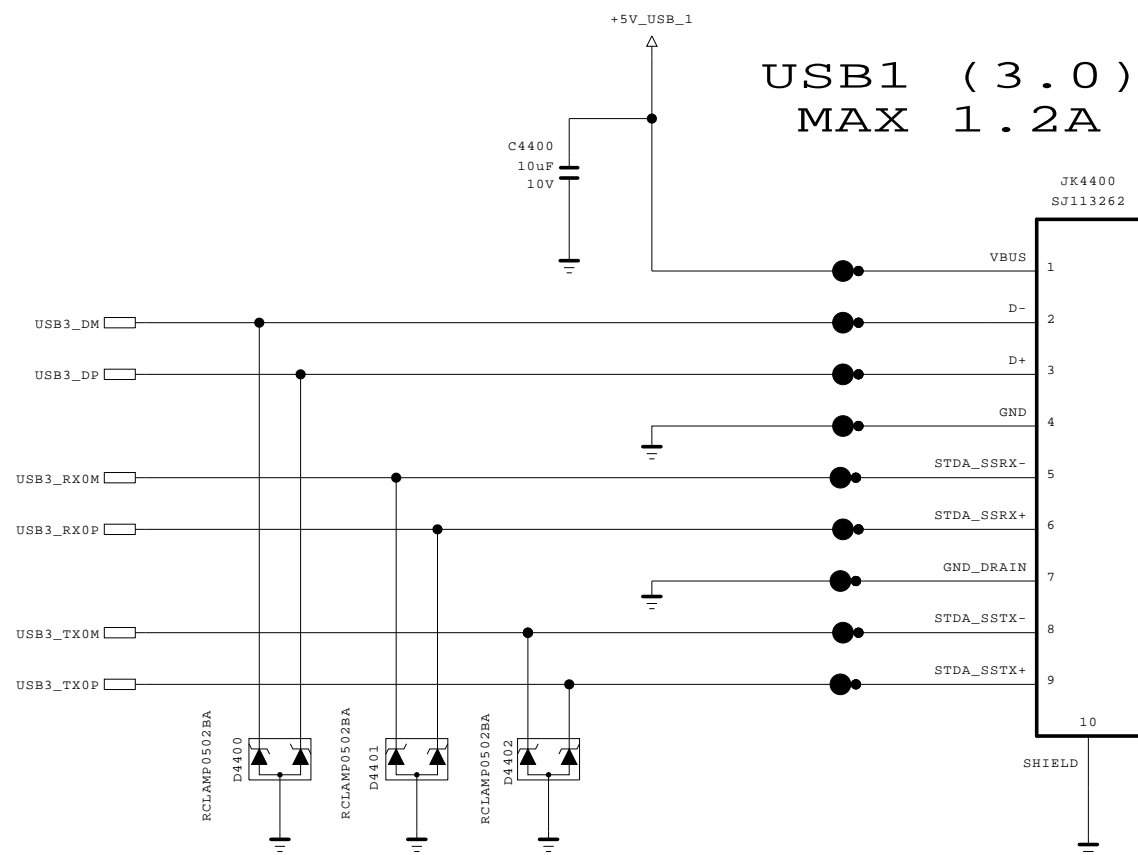
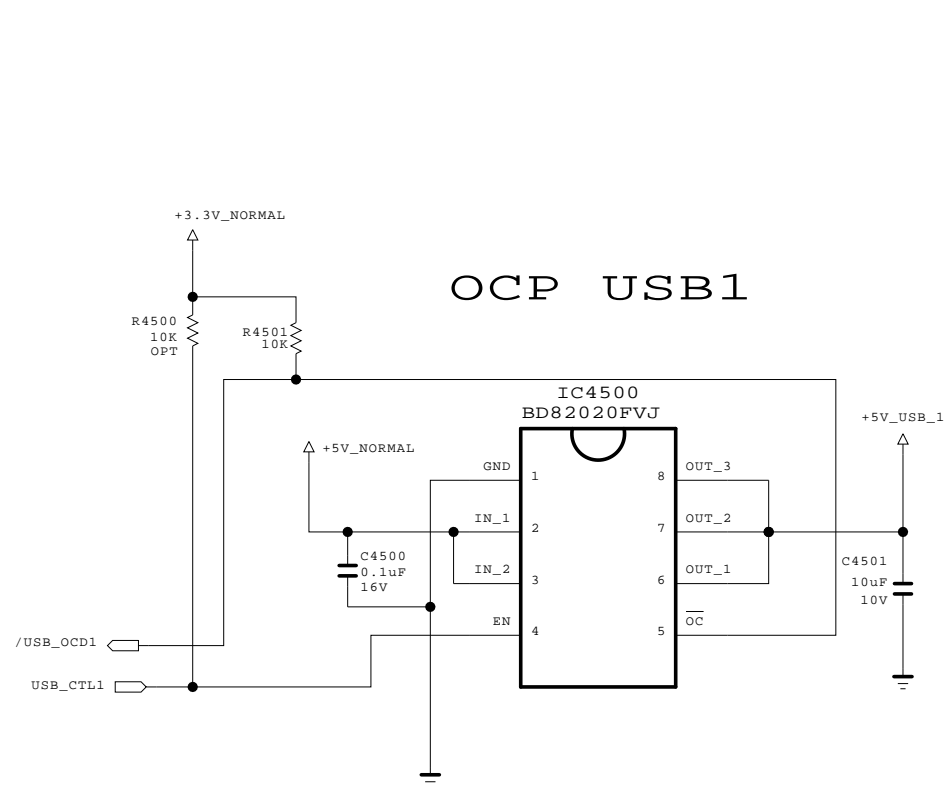
MODEL		JACK HIGH/MID	DATE	2012.10.09
BLOCK			SHEET	/





SECRET
LG Electronics



MODEL	USB3_HUB	DATE	2012.10.08
BLOCK		SHEET	/



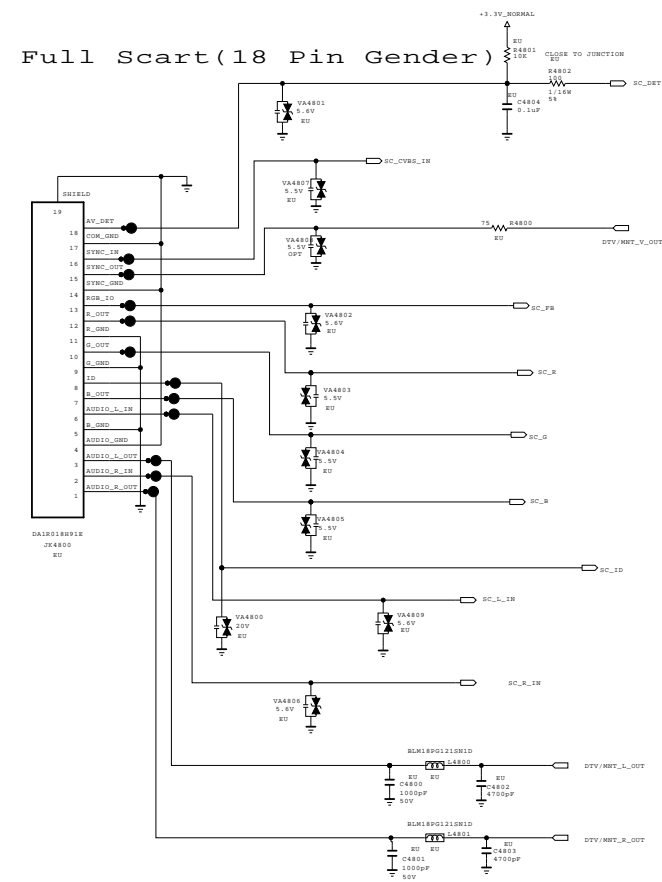
THE  SYMBOL MARK OF THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFACTURES SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE  SYMBOL MARK OF THE SCHEMATIC.



SECRET

LG Electronics

 LG ELECTRONICS

BSD-NC4_H044-HD			
MODEL		DATE	2012-11-09
BLOCK	USB JACK	SHEET	/



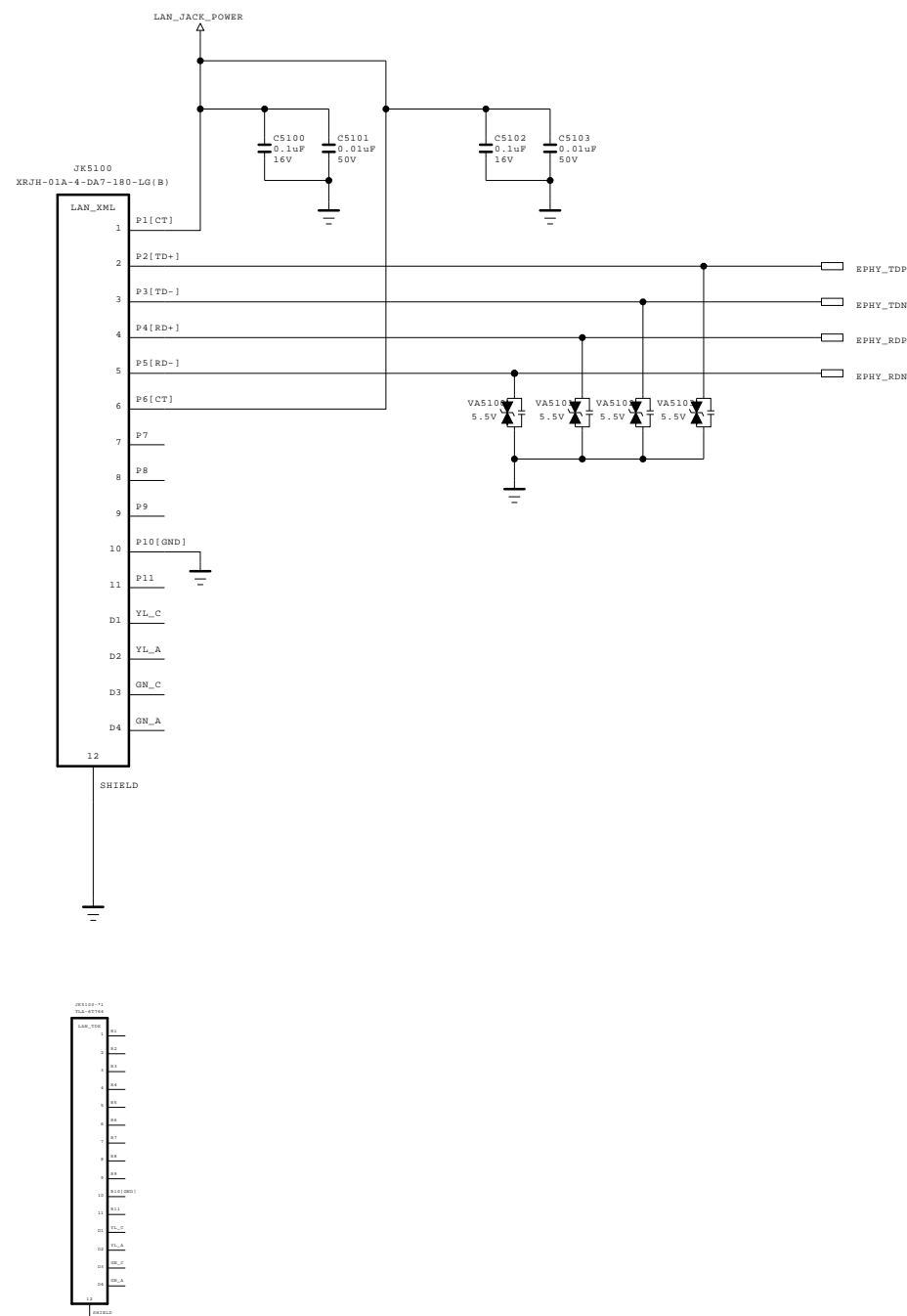
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SECRET
LGElectronics



BSD-NC4_H048-HD			
MODEL		DATE	2012.10.31
BLOCK	SCART GENDER	SHEET	/

Ethernet Block



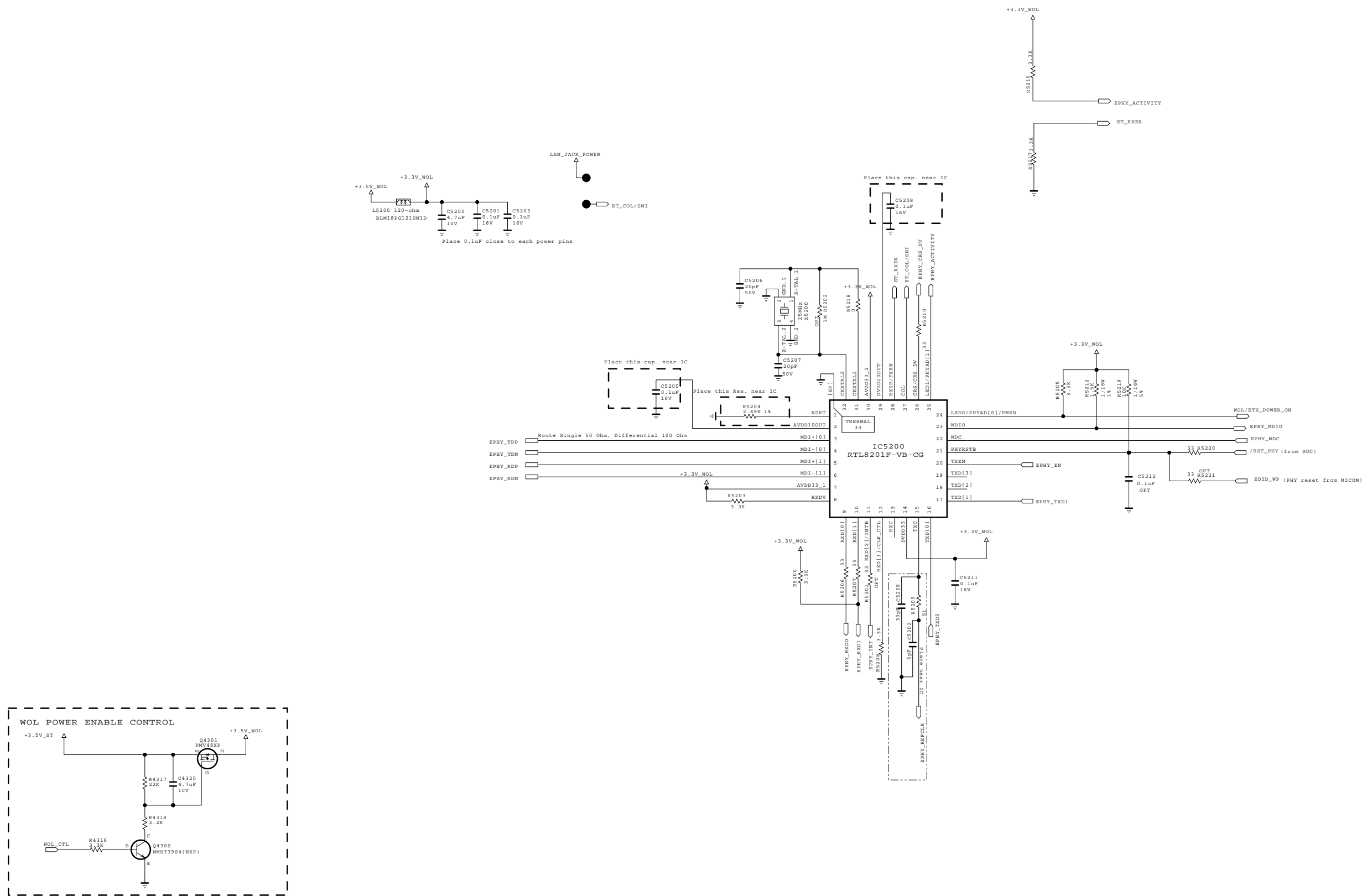
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SECRET
LGElectronics



MODEL	LAN_VERTICAL	DATE	2011.12.09
BLOCK		SHEET	50 /

Ethernet Block

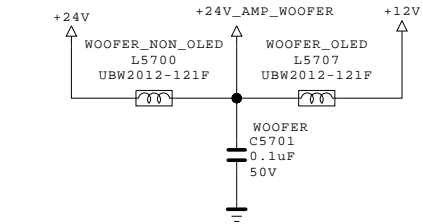
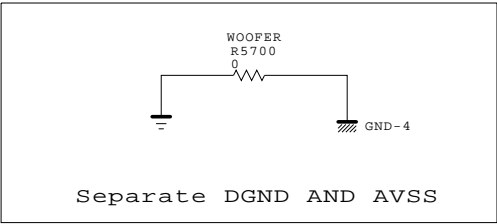


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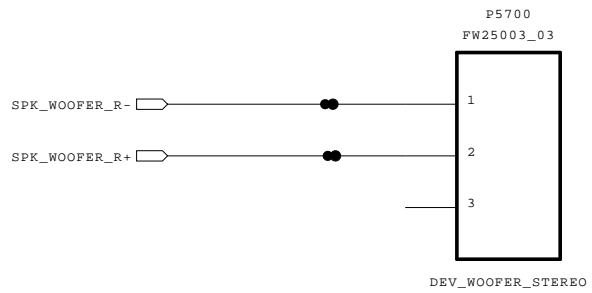
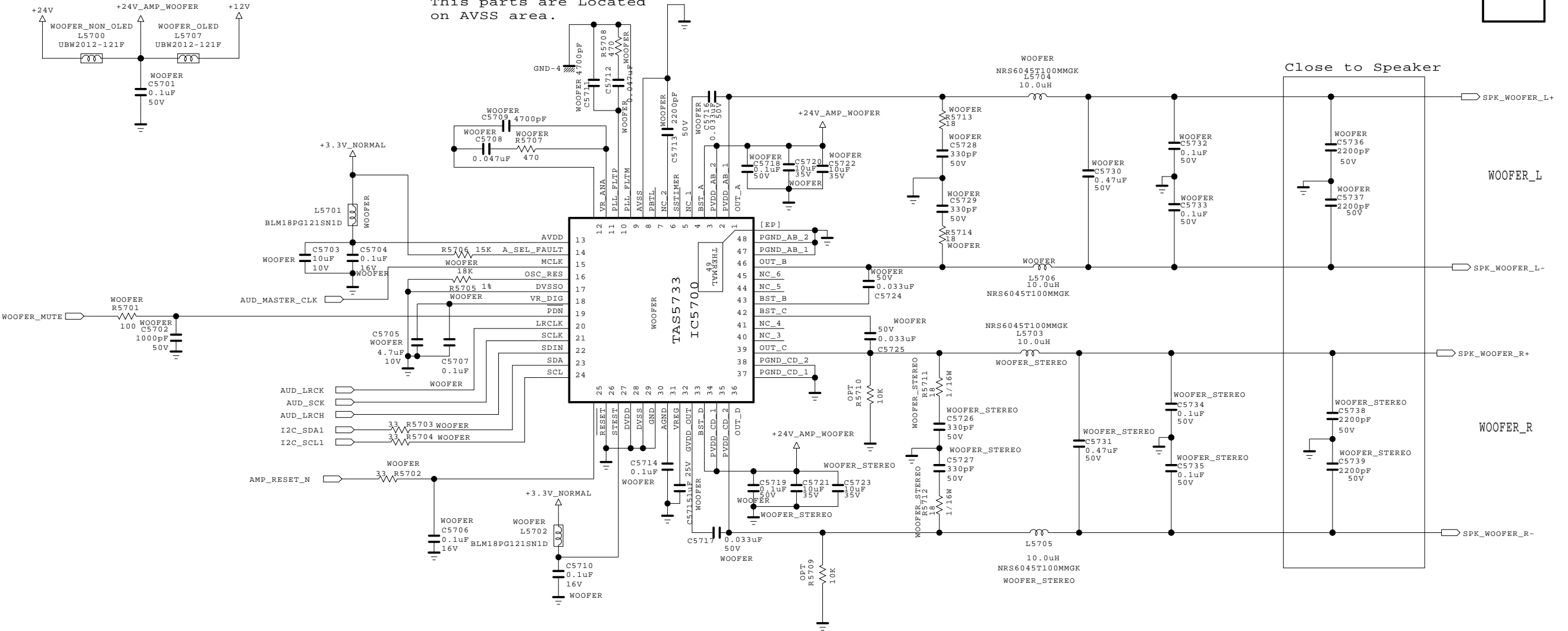
SECRET
LGElectronics





BSD-NC4_H052-HD			
MODEL		DATE	2012-09-12
BLOCK	ETHERNET	SHEET	/



This parts are Located on AVSS area.

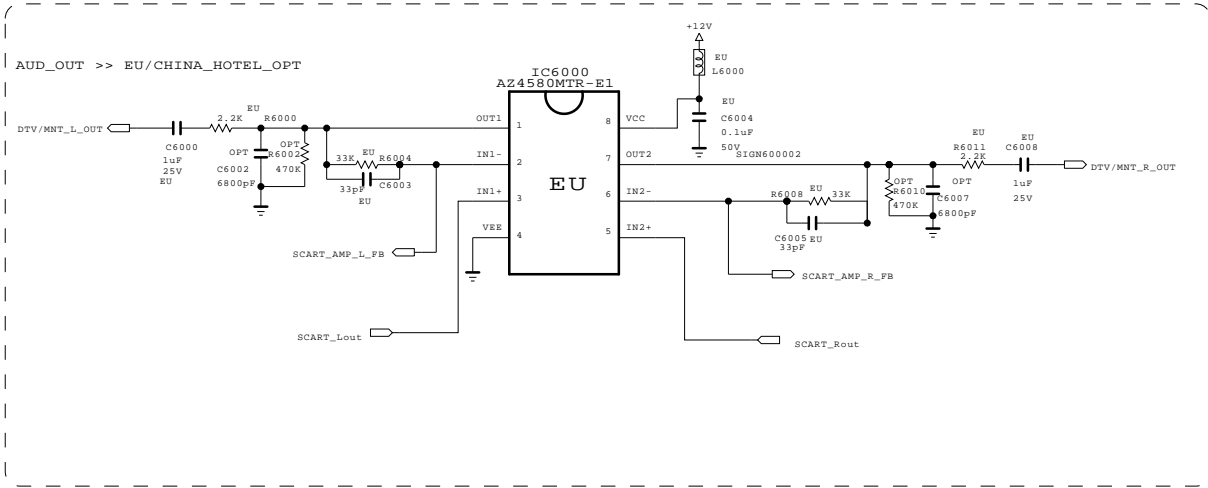


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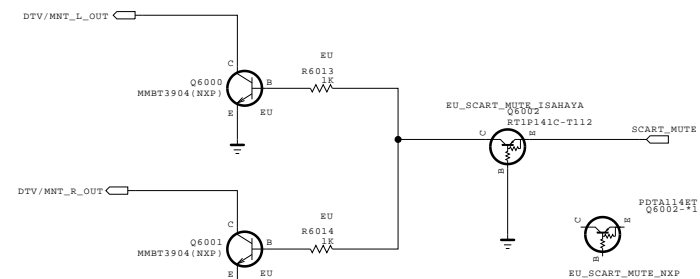
SECRET
LGElectronics



 LG ELECTRONICS

MODEL	GP4_MT5369	DATE	2011.11.21
BLOCK	AUDIO[ST]	SHEET	58 /



[SCART AUDIO MUTE]

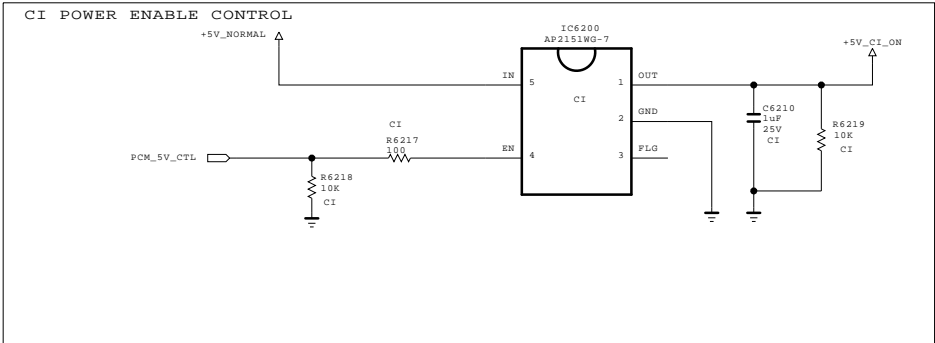




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LGElectronics



MODEL	SCART AUDIO AMP	DATE	2011.11.21
BLOCK		SHEET	60 /



THE  SYMBOL MARK OF THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFATURES SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE  SYMBOL MARK OF THE SCHEMATIC.

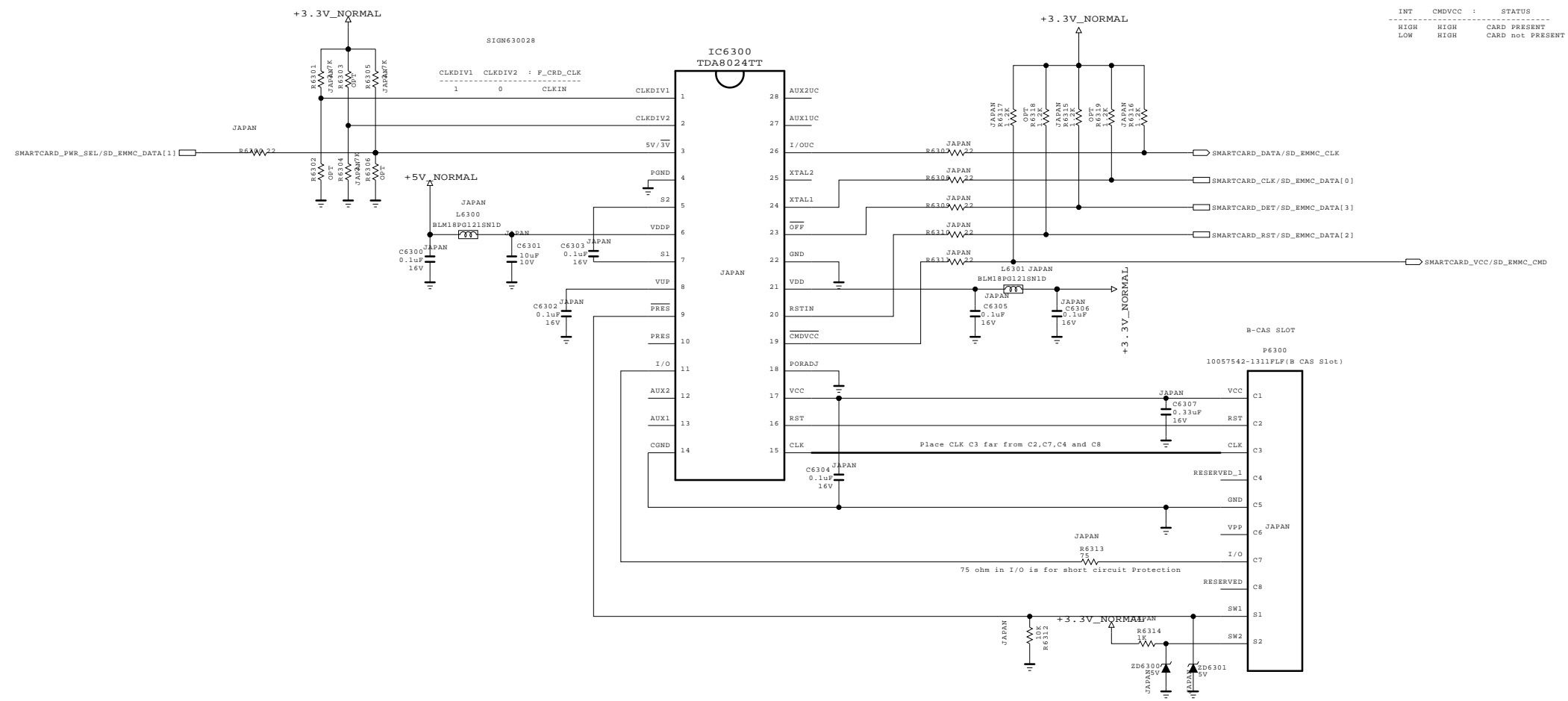
SECRET
LGElectronics





LG ELECTRONICS

MODEL	CI SLOT	DATE	2011.10.31
BLOCK		SHEET	62 /

B-CAS (SMART CARD) INTERFACE

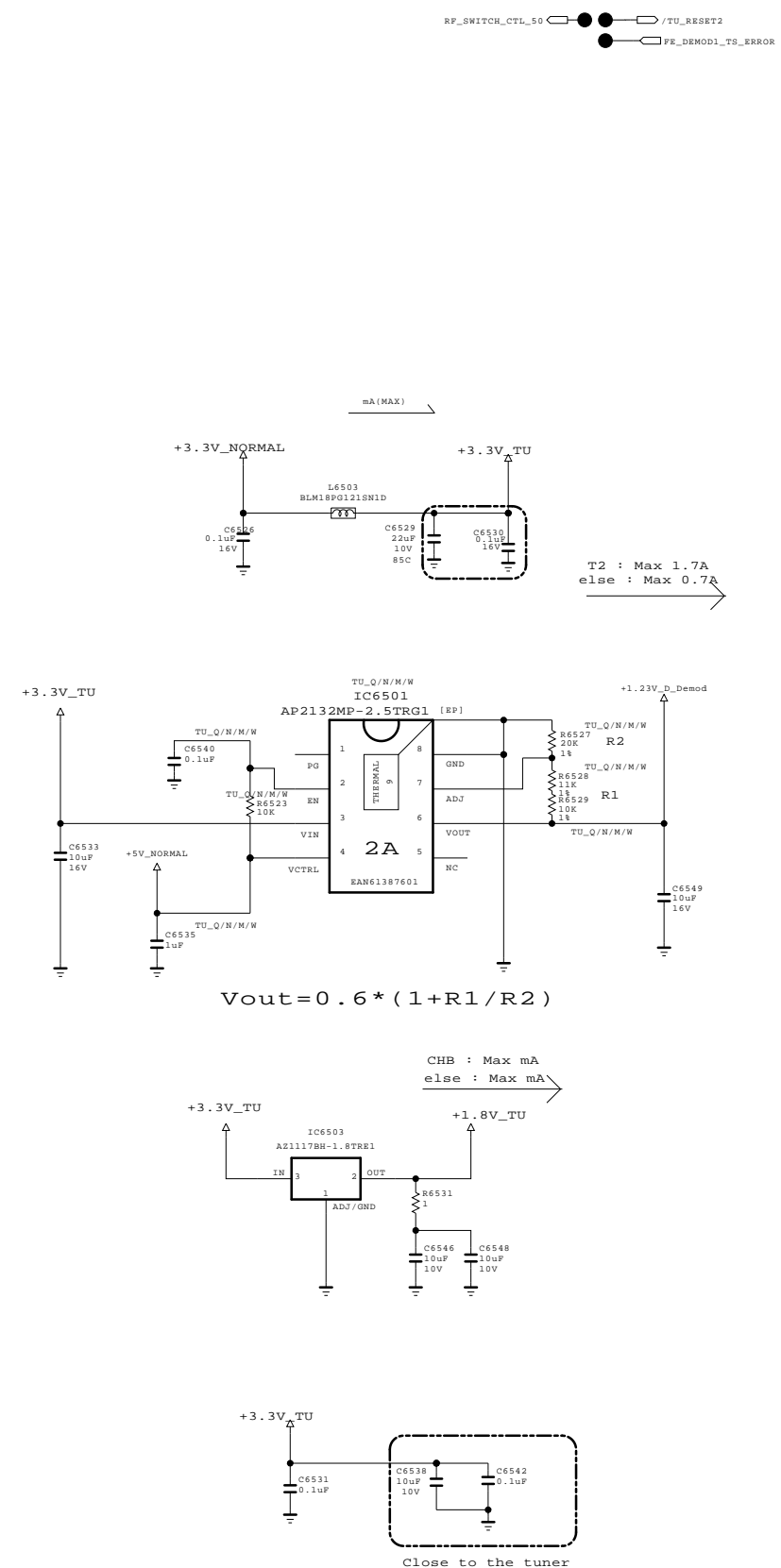


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SECRET
LGElectronics



MODEL	CI SLOT	DATE	2011.04.17
BLOCK		SHEET	62 /



```

13' Tuner Type for Global
TDS'S'-G501D: T/C Half NIM Horizontal Type
TDS'Q'-G501D: T/C/S2 Combo Horizontal type
TDS'Q'-G601D: T2/C/S2 Combo Horizontal Type
TDS'Q'-G651D: T2/C/S2 Combo Vertical Type
TDS'M'-C601D: China NIM with Isolater Type
TDS'W'-J551F: Japan Dual NIM
TDS'W'-B651F: Brazil 2Tuner
TDS'W'-A651F: Taiwan 2Tuner
TDS'W'-K651F: Colombia DVB-T2 2Tuner

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SECRET
LGElectronics



MODEL	TUNER	DATE	2012.07.10
BLOCK		SHEET	65 /

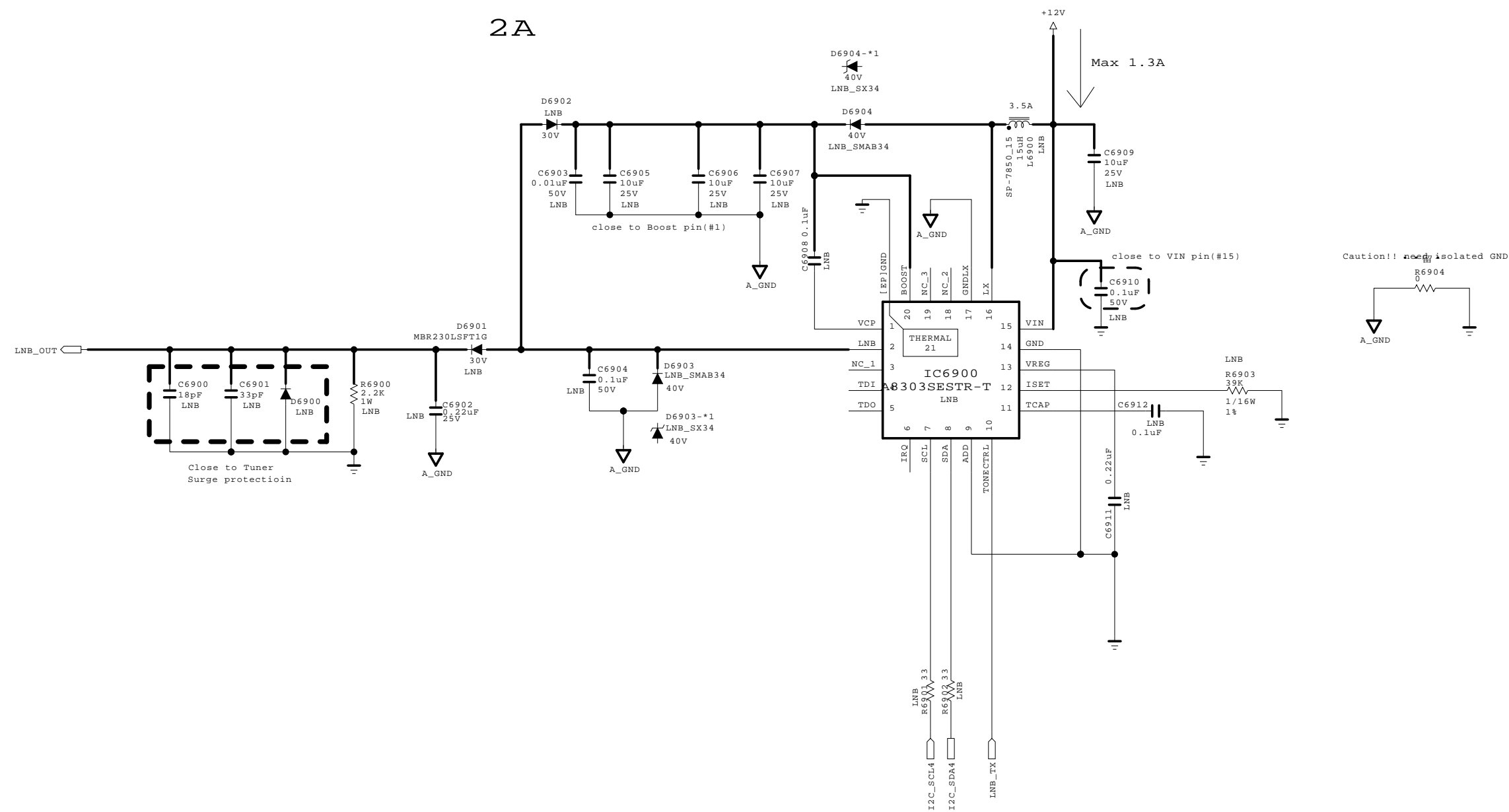
DVB-S2 LNB Part Allegro



(Option:LNB)

3A

Input trace widths should be sized to conduct at least 3A
Ouput trace widths should be sized to conduct at least 2A

2A



THE  SYMBOL MARK OF THIS SCHEMETIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFATURES SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE  SYMBOL MARK OF THE SCHEMETIC.

SECRET

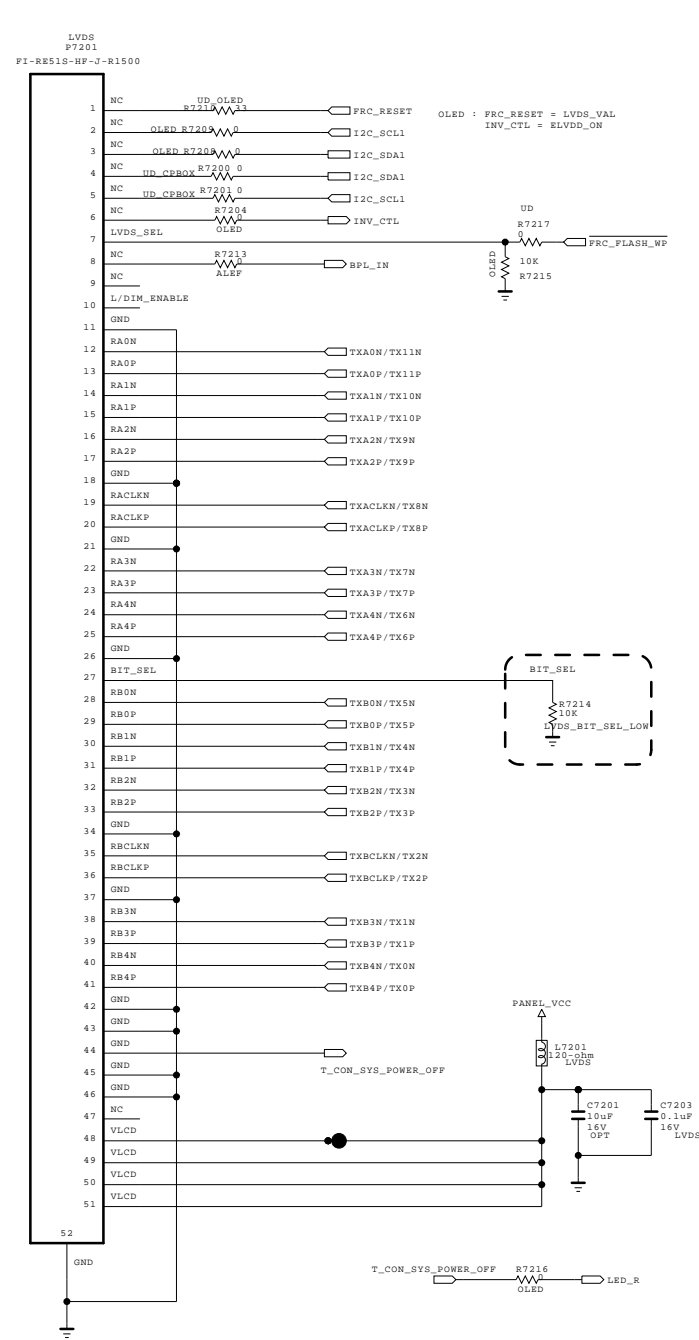
LG Electronics

 LG ELECTRONICS

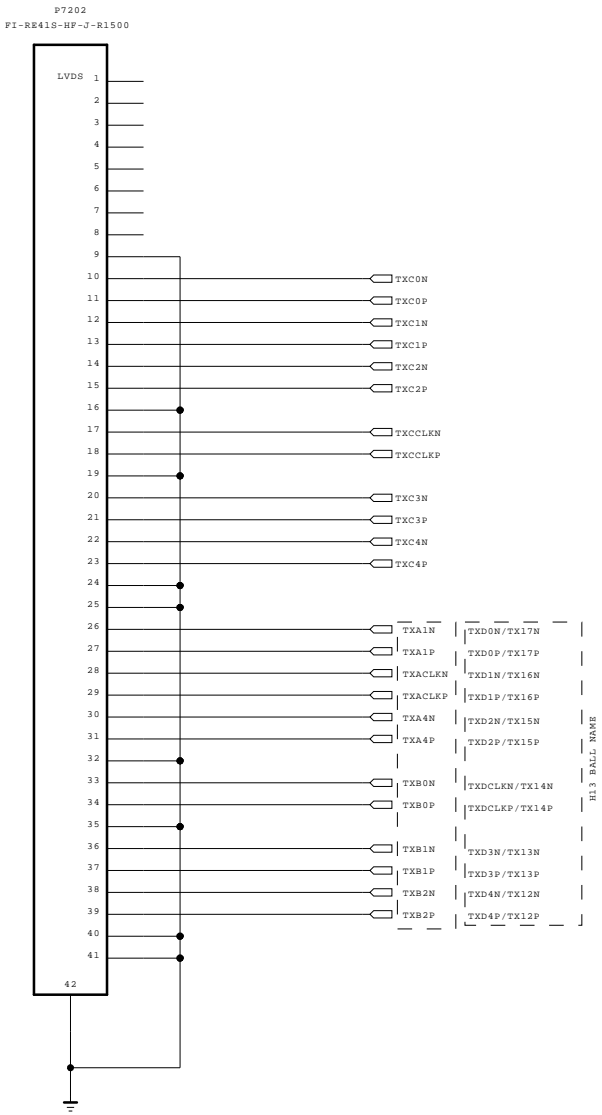
MODEL	LNB	DATE	2012.03.08
BLOCK		SHEET	69 /



LVDS

[51Pin LVDS OUTPUT Connector]



[41Pin LVDS OUTPUT Connector]

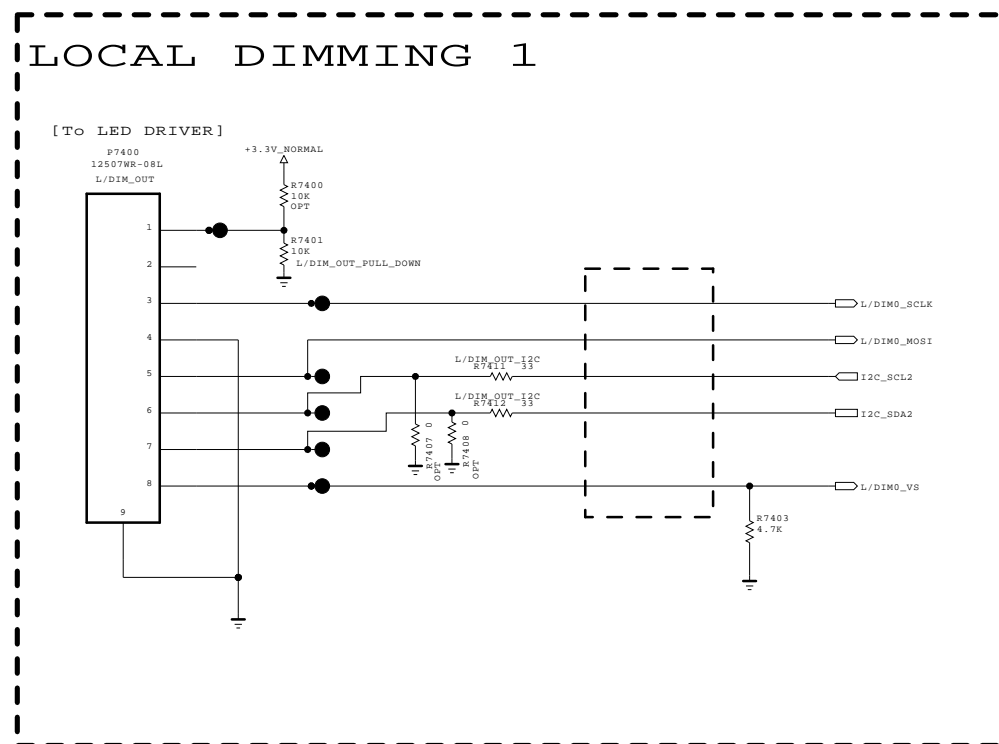


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LGElectronics



MODEL				DATE		2012-10-15	
BLOCK		LVDS INTERFACE		SHEET		/	



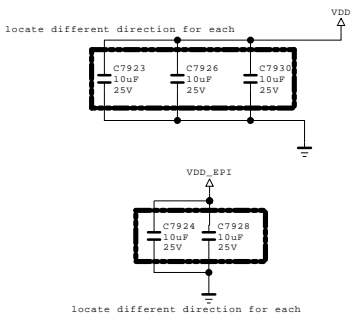
THE SYMBOL MARK OF THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFACTURES SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE SYMBOL MARK OF THE SCHEMATIC.



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LGElectronics



BSD-NC4_H074-HD

MODEL	LOCAL DIMMING	DATE	2012.09.14
BLOCK		SHEET	/



THE  SYMBOL MARK OF THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFATURES SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE  SYMBOL MARK OF THE SCHEMATIC.

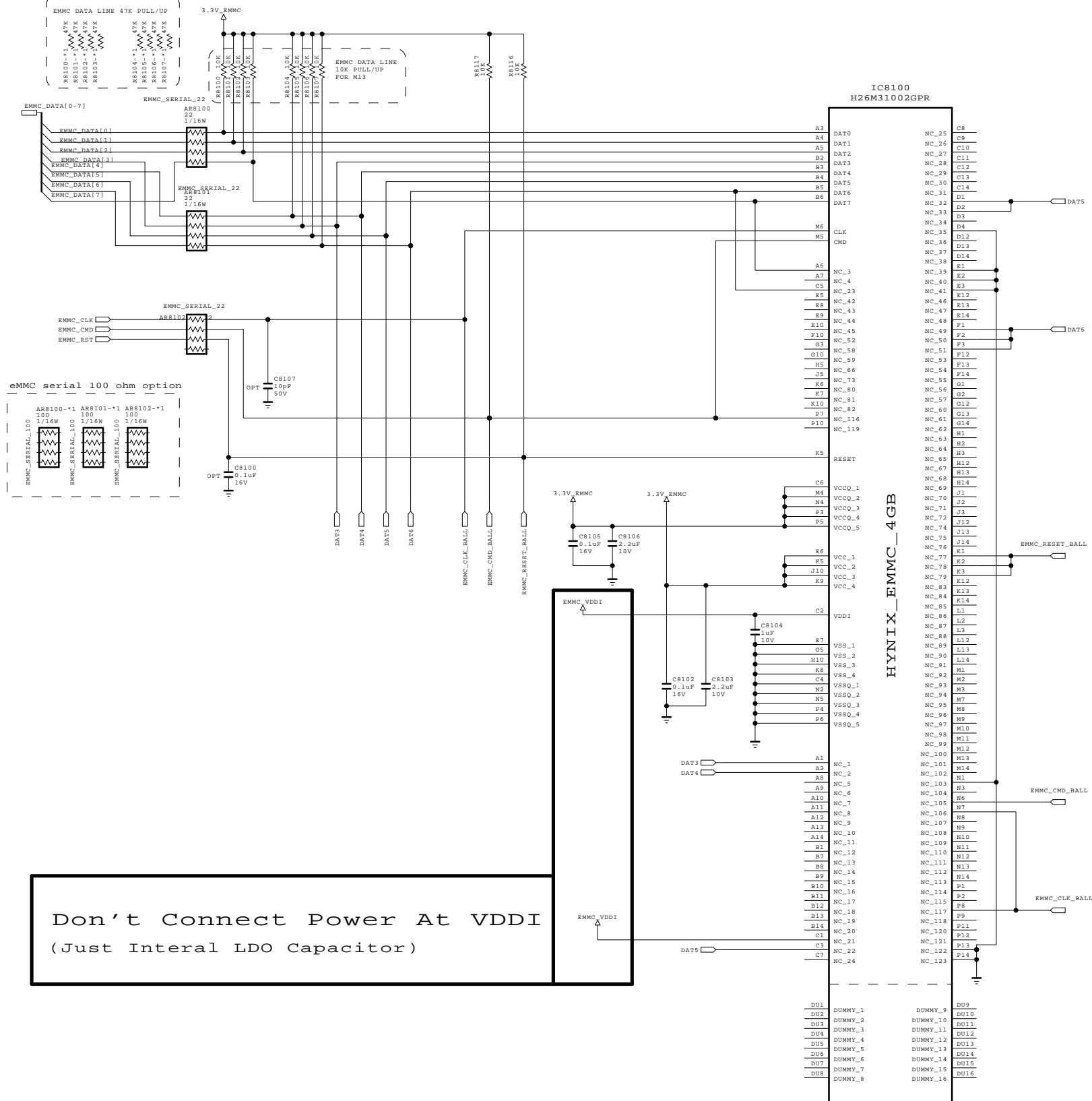
SECRET
LGElectronics



BSD-NC4_H079-HD

MODEL		DATE	2012.09.14
BLOCK	EPI_CAP	SHEET	/

eMMC I/F



THE SYMBOL MARK OF THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFACTURES SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE SYMBOL MARK OF THE SCHEMATIC.

SECRET
LGElectronics

LG ELECTRONICS

MODEL	eMMC	DATE	11.09.29
BLOCK		SHEET	81



2013 LED/LCD TV Engineering guide

< Applicable Model : High-end Platform >

EPI Interface

● EPI(Embedded Point-Point Interface)

● Features

- Point-Point topology (support 2 Pair option)
- CDR (Clock Data Recovery)
- Bandwidth up to 1.85Gbps/pair at FHD 120Hz 10 bit application
- Lock signal cascading and feedback to T-Con
- Embedded Control Data

● Merits

- Better reliability on common noise
- No data skew and better EMI margin
- Fewer lines than mini-LVDS
- Slim PCB design

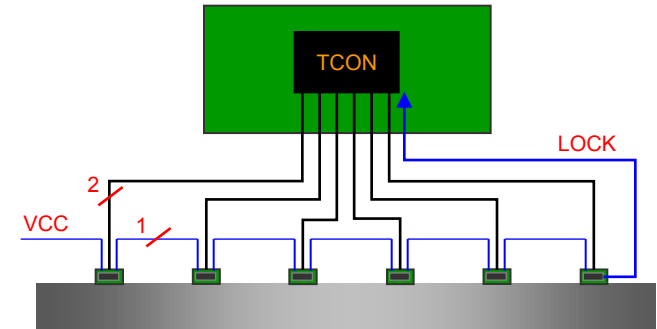


Figure1. Topology

Table 1. Example of FHD 120Hz TV

EPI	FHD (10bit) @ 960Ch		
	60Hz	120Hz	240Hz
Transmission Line	12	12	24
Bandwidth	0.84Gbps	1.68Gbps	1.68Gbps

EPI Interface (mini-LVDS vs. EPI)

Comparison

HF mini-LVDS

HF mini-LVDS	FHD (10bit)		
	60Hz	120Hz	240Hz
No. of Signal	36	36	72
Connector	60pin (2ea)	60pin (2ea)	80pin (2ea)

- Difficult to upgrade bandwidth limit
- Multiple number of wires needed for higher bandwidth

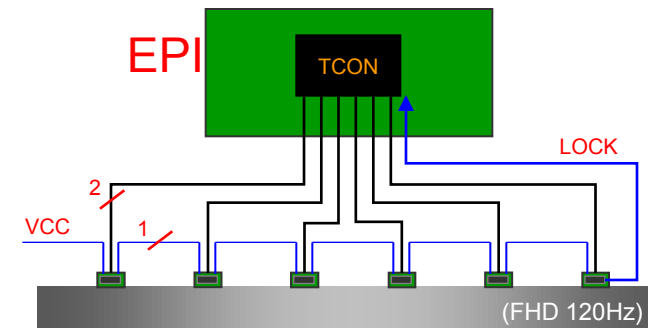
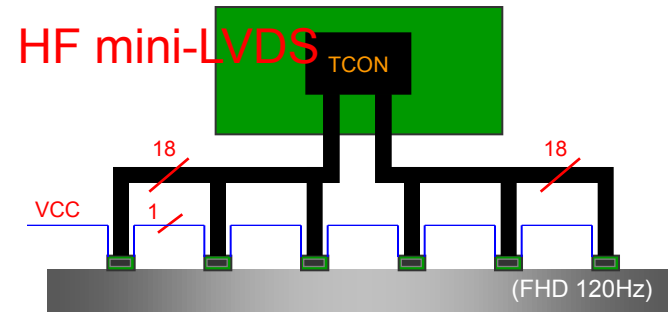
EPI (Embedded clock P-to-P Interface)

EPI	FHD (10bit)		
	60Hz	120Hz	240Hz
	960ch	960ch	720ch
No. of Signal	12	12	32
Connector	-	50 pin (2ea)	70pin (2ea)

- Better reliability on common noise
- No data skew. Better EMI margin
- Lower cost (Cable, Connector)
- Slim S-PCB design (14mm → 10mm) helps slimmer TV

What to change

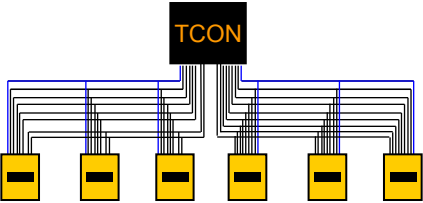
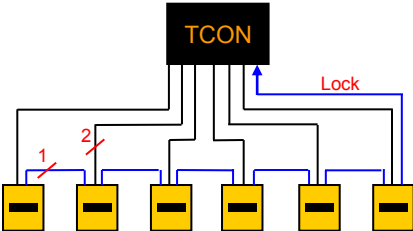
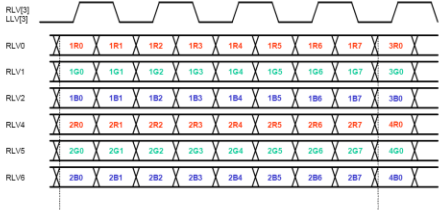

LCM (T-con to S-Driver IC)



* Bandwidth Capability

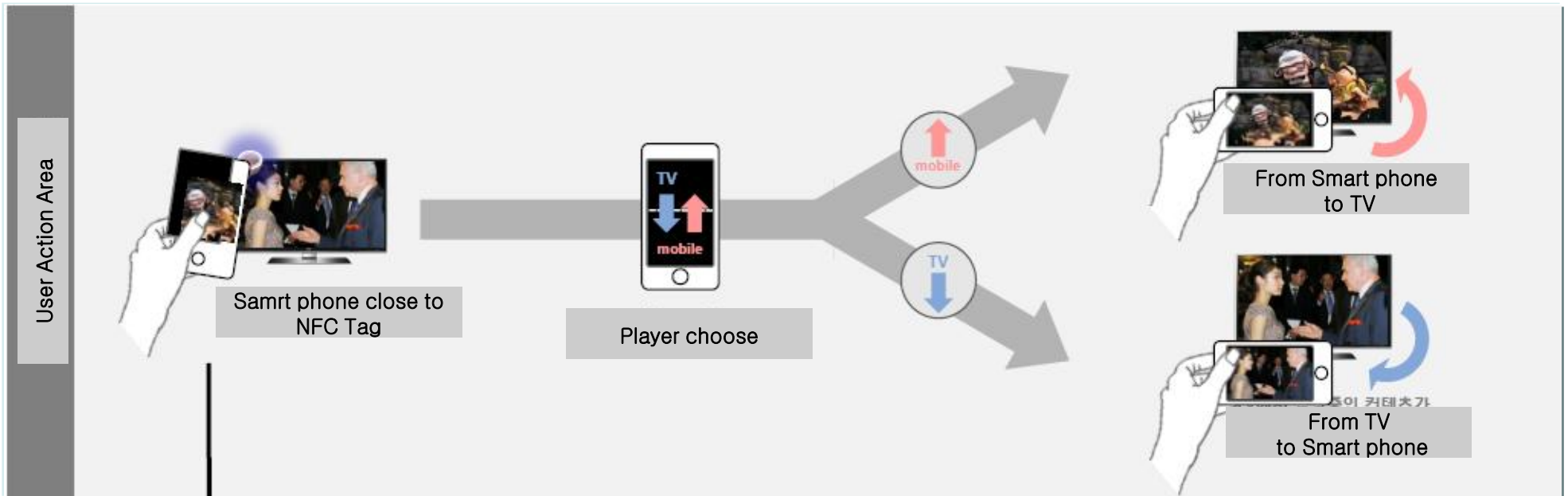
- FHD 120Hz 10Bit : 594Mbps@36Lines → 1.65Gbps@12Lines
- FHD 240Hz 10Bit : 594Mbps@72Lines → 1.25Gbps@32Lines

EPI Interface (mini-LVDS vs. EPI)

	HF mini-LVDS	EPI												
Topology														
Protocol		 <table border="1" data-bbox="1342 582 1798 711"><thead><tr><th>Bit</th><th>Name</th><th>Description</th></tr></thead><tbody><tr><td>0, 1</td><td>CK</td><td>Indicates a rising edge of bit clock. (Always "H")</td></tr><tr><td>2 ~ 30</td><td>-</td><td>RGB data are transmitted. LSB is transmitted at first. 2 ~ 11 : R0 ~ R9 12 ~ 21 : G0 ~ G9 22 ~ 31 : B0 ~ B9</td></tr><tr><td>32, 33</td><td>DMY</td><td>Dummy (Always "L")</td></tr></tbody></table>	Bit	Name	Description	0, 1	CK	Indicates a rising edge of bit clock. (Always "H")	2 ~ 30	-	RGB data are transmitted. LSB is transmitted at first. 2 ~ 11 : R0 ~ R9 12 ~ 21 : G0 ~ G9 22 ~ 31 : B0 ~ B9	32, 33	DMY	Dummy (Always "L")
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32, 33	DMY	Dummy (Always "L")												
Features @10bit, FHD120	<ul style="list-style-type: none">• Multi Drop• Data rate: 660Mbps• External clock	<ul style="list-style-type: none">• Point to Point• Data rate : 1.8Gbps• Embedded clock, Control												
Merit	<ul style="list-style-type: none">• Simple structure• Standardization	<ul style="list-style-type: none">• Fewer Lines : 12• Embedded clock : low EMI, Clock skew free• Easy to PCB design												
Demerit	<ul style="list-style-type: none">• Too many lines : 36• Clock skew• EMI due to clock lines• Bandwidth limit	<ul style="list-style-type: none">• Transmission Overhead : 4bit delimiter												

NFC (Near field communication)

Near field communication (NFC) is a set of standards for smartphones and similar devices to establish radio communication with each other by touching them together or bringing them into close proximity, usually no more than a few centimetres. Present and anticipated applications include contactless transactions, data exchange, and simplified setup of more complex communications such as Wi-Fi. Communication is also possible between an NFC device and an unpowered NFC chip, called a "tag".



Tag On



Tag On

Touch the smartphone to the Tag On sticker.

- Using an LG smartphone with the NFC and Miracast functions, you can:

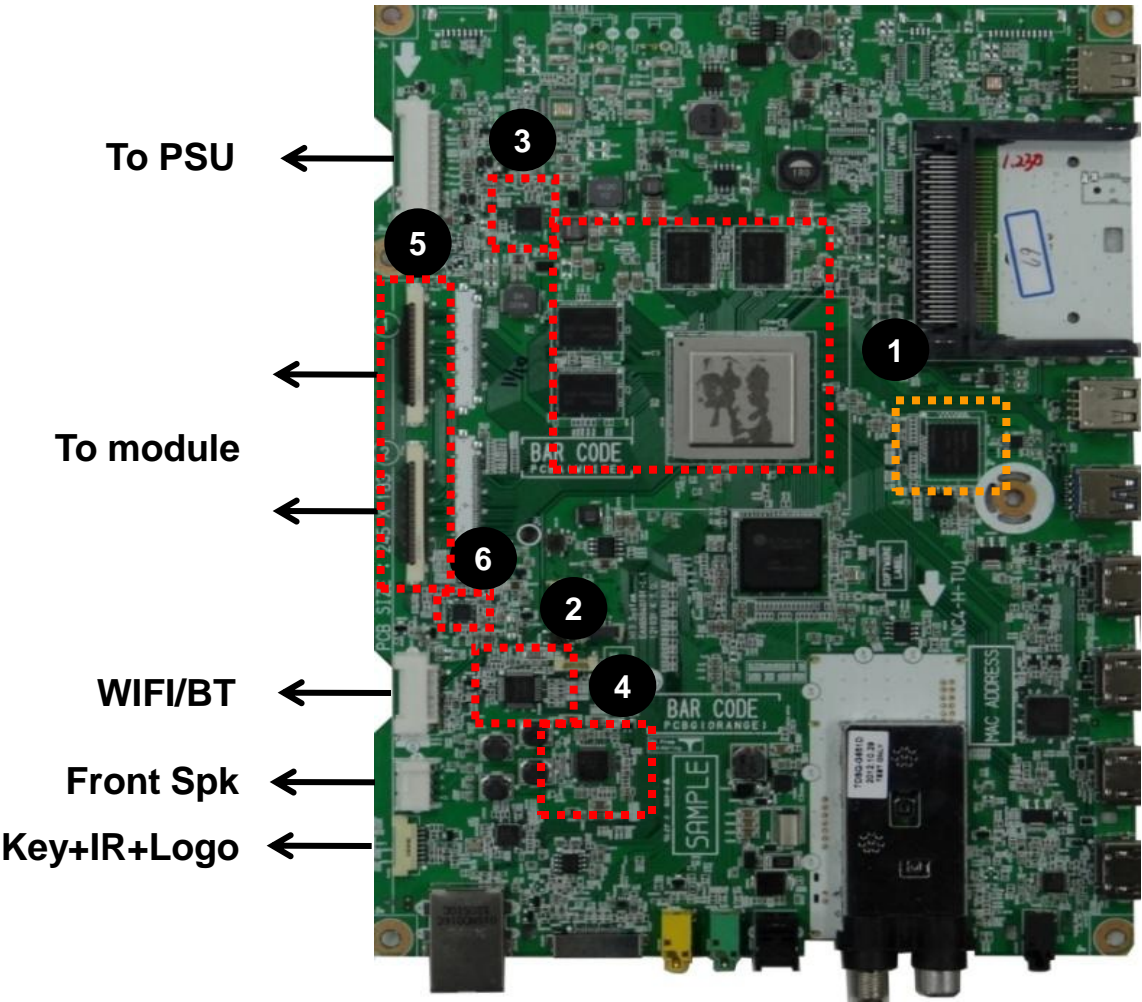
- TV to Phone: run the LG TV Remote app on the smartphone.
- Phone to TV: view the screen of the smartphone on the TV.

To end the connection, touch the smartphone to the Tag On sticker again.

(You can also disable the Miracast function on the smartphone.)

xxLA790V-Zx

Chassis : LD34D
PCB P/No : EAX65040103



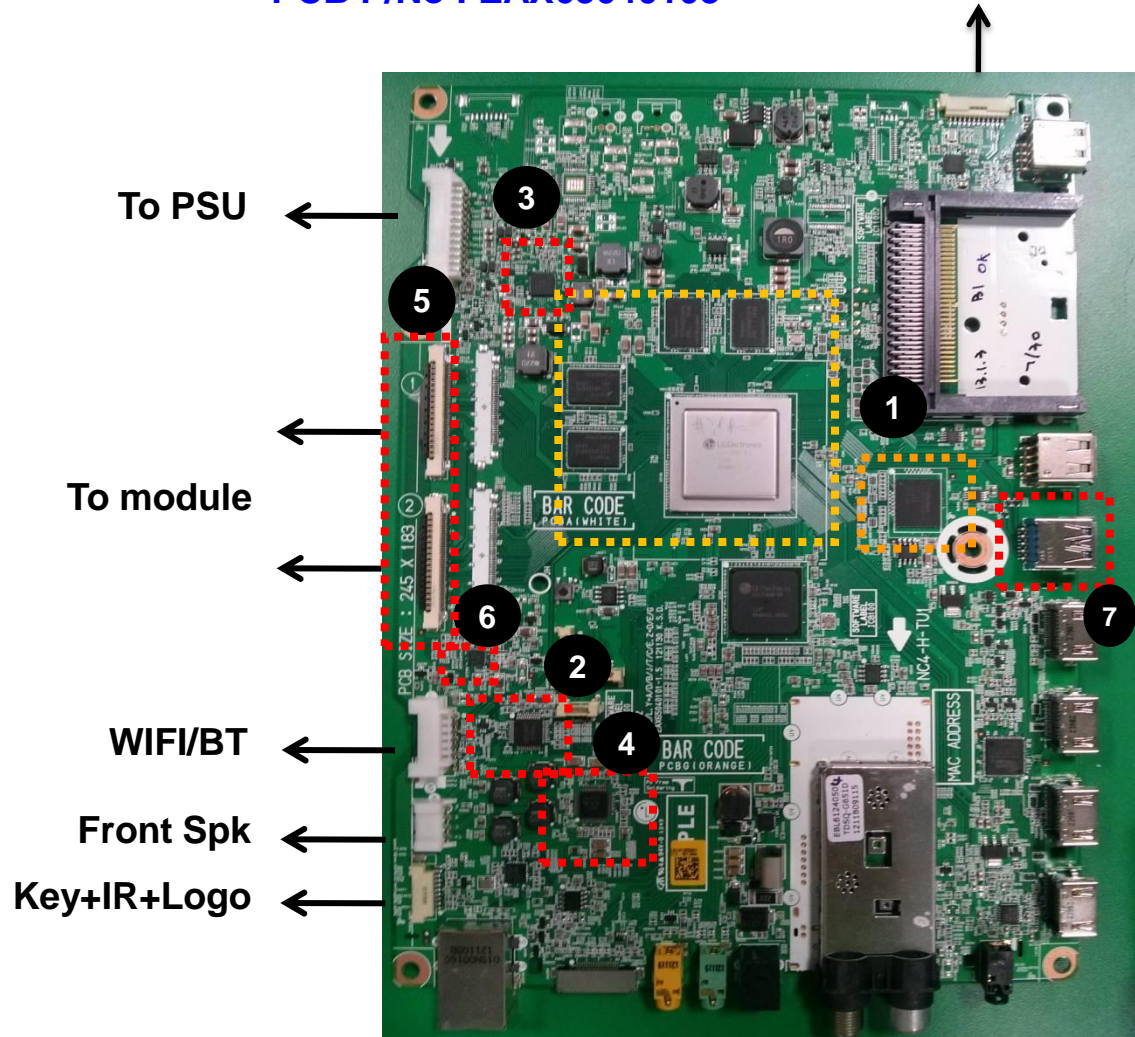
- 1 Main processor, DDR Memory
eMMC Memory
- 2 Micom for Key/IR/Logo sensing
- 3 PMIC
- 4 Audio AMP
- 5 EPI Wafer
- 6 Level shifter

Main + TCON all in one

Chassis : LD34D

PCB P/No : EAX65040103

To Camera



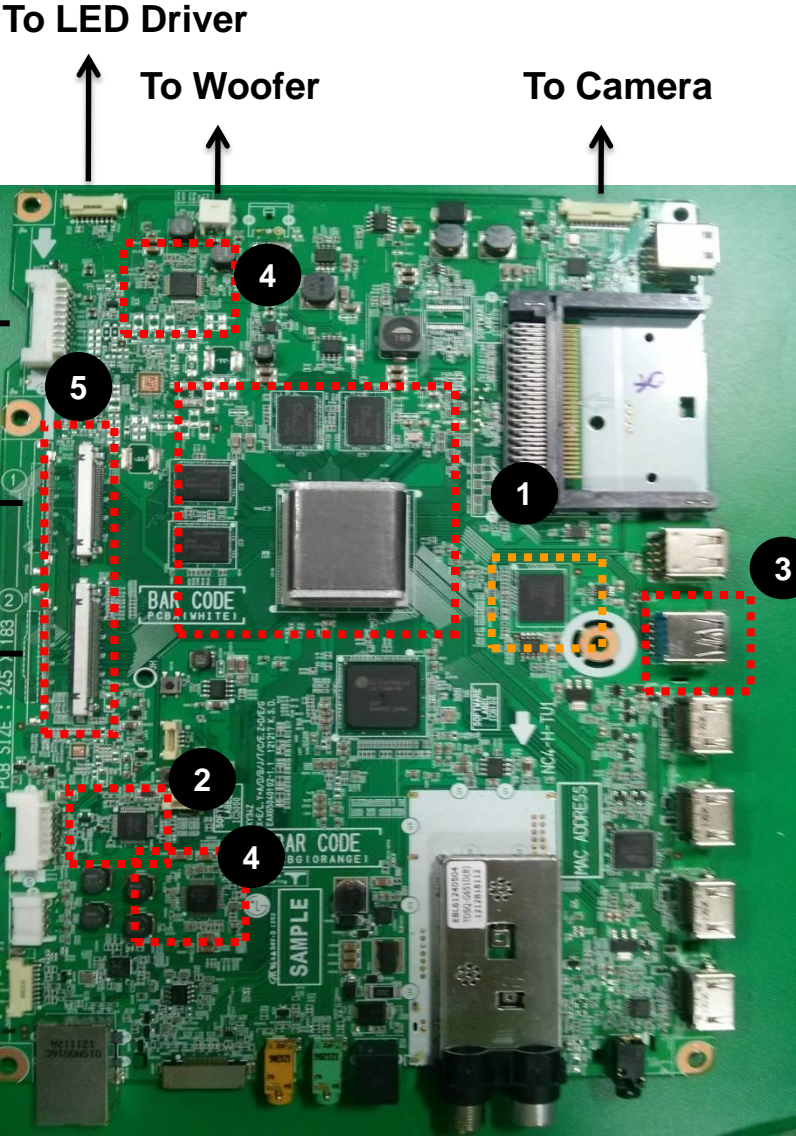
- 1 Main processor, DDR Memory
eMMC Memory
- 2 Micom for Key/IR/Logo sensing
- 3 PMIC
- 4 Audio AMP
- 5 EPI Wafer
- 6 Level shifter
- 7 USB 3.0

Main PCB for Broadband

Main + TCON all in one

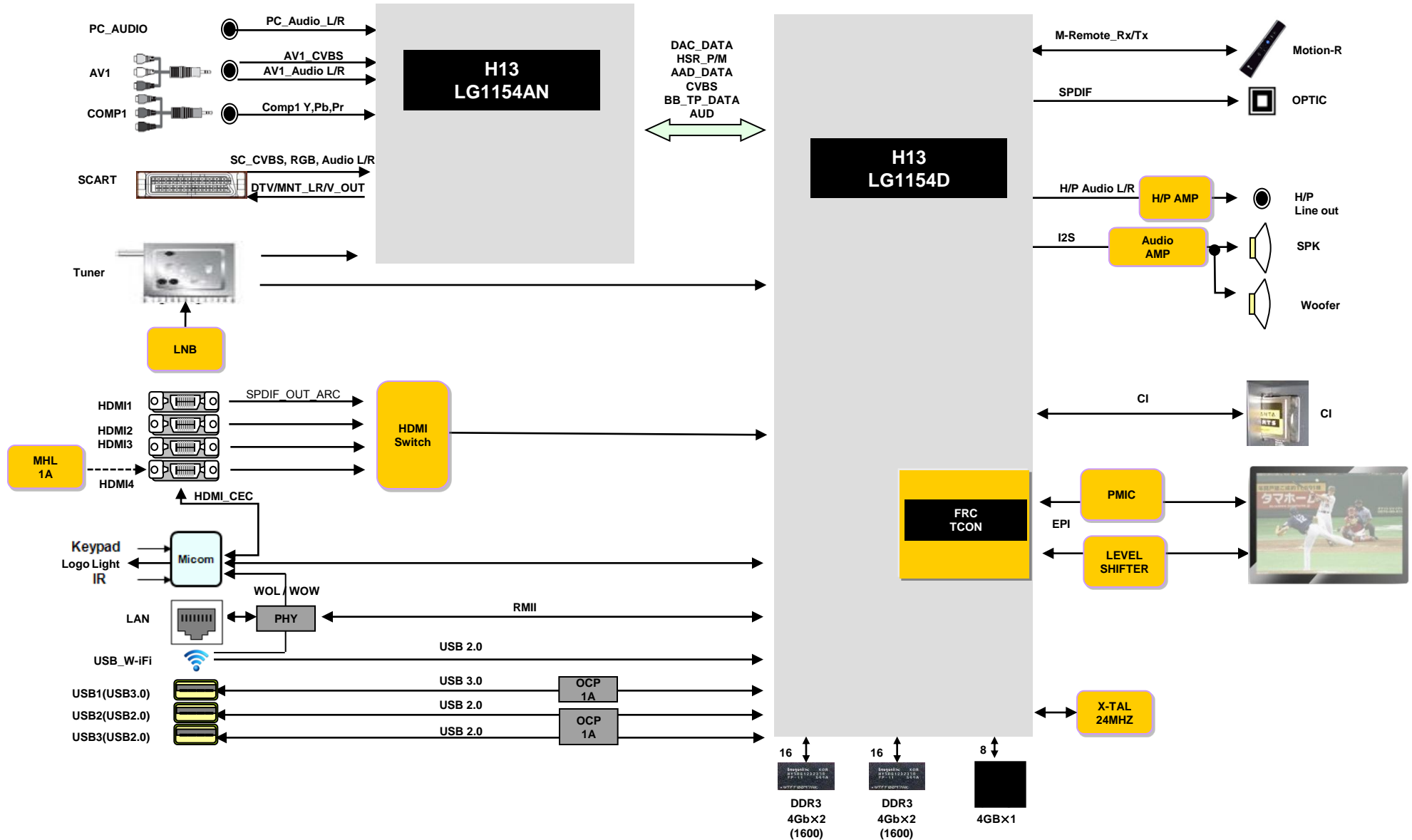
xxLA960V-Zx

Chassis : LD34D
PCB P/No : EAX65040103

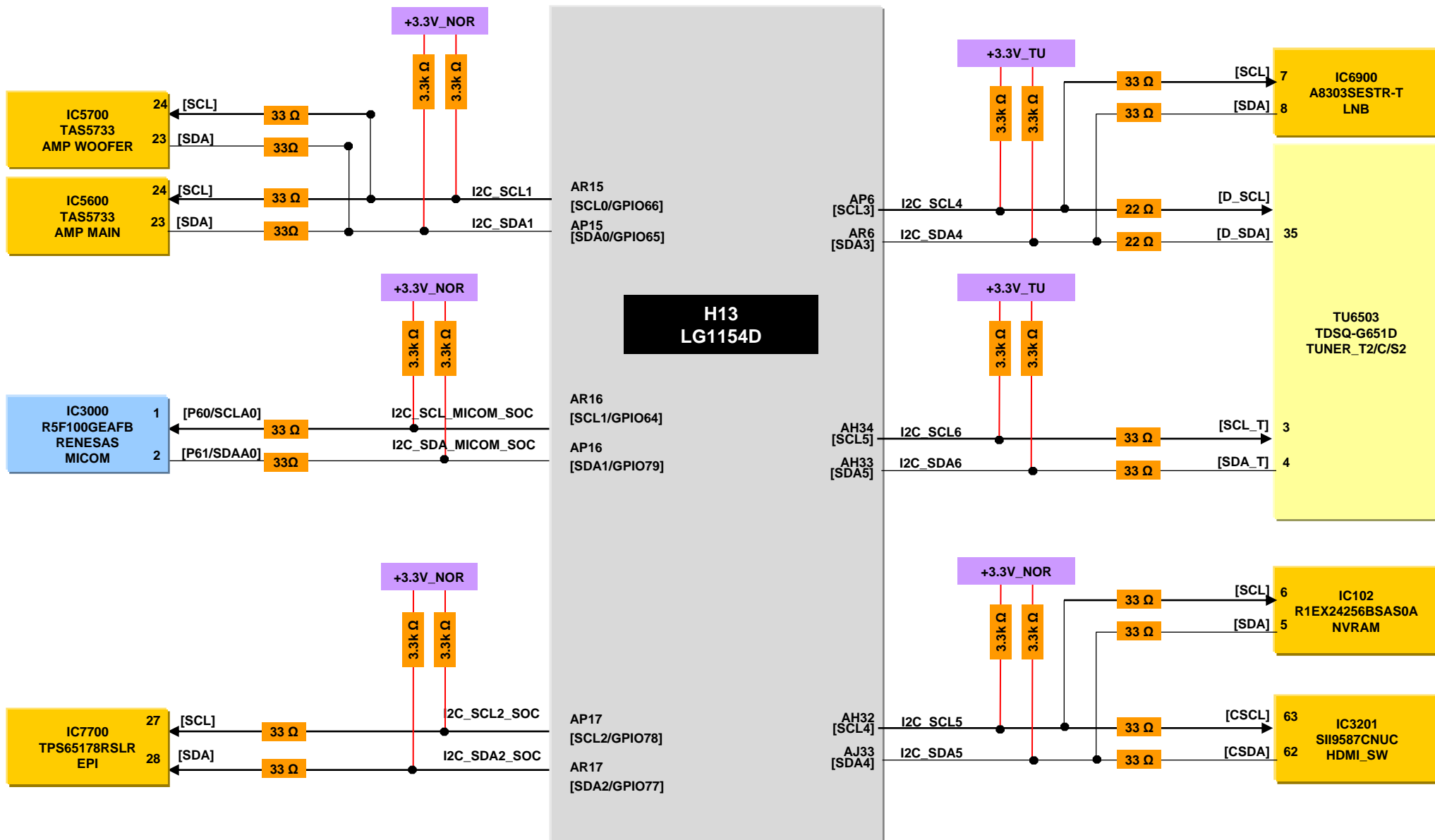


- 1 Main processor, DDR Memory
eMMC Memory
- 2 Micom for Key/IR/Logo sensing
- 3 USB 3.0
- 4 Audio AMP
- 5 LVDS Wafer

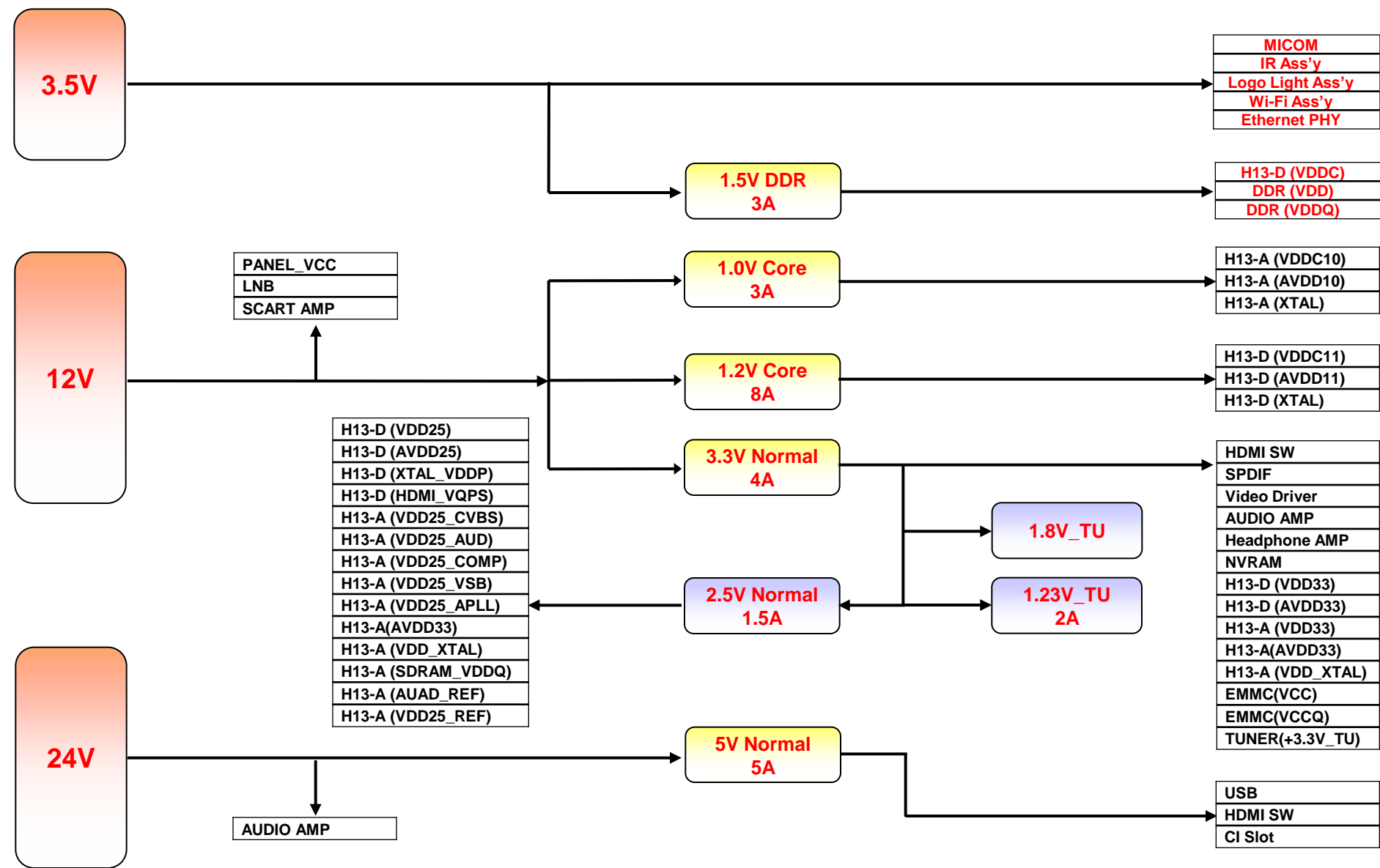
1. H13 Block Diagram (External)



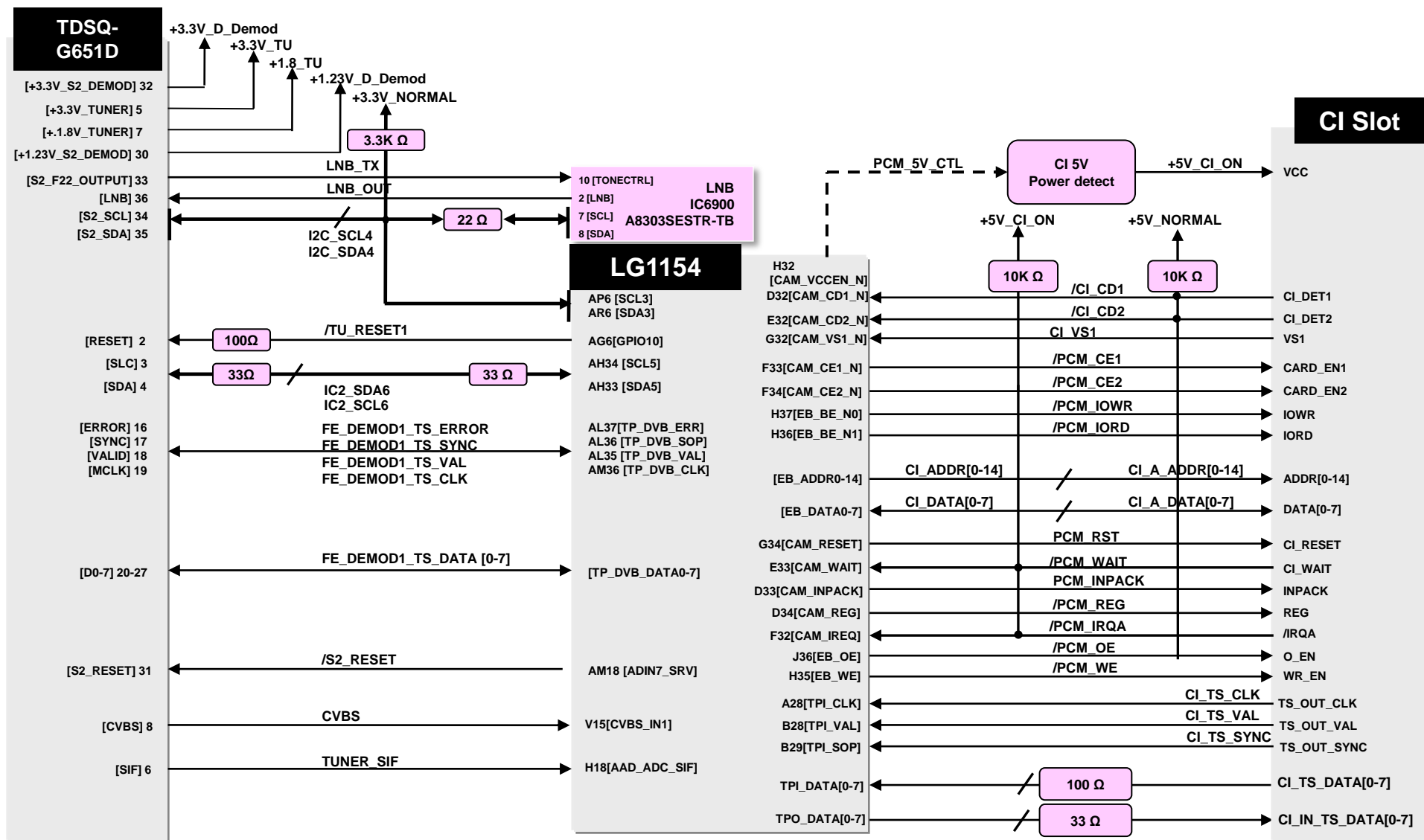
2. LG1154 I2C Map



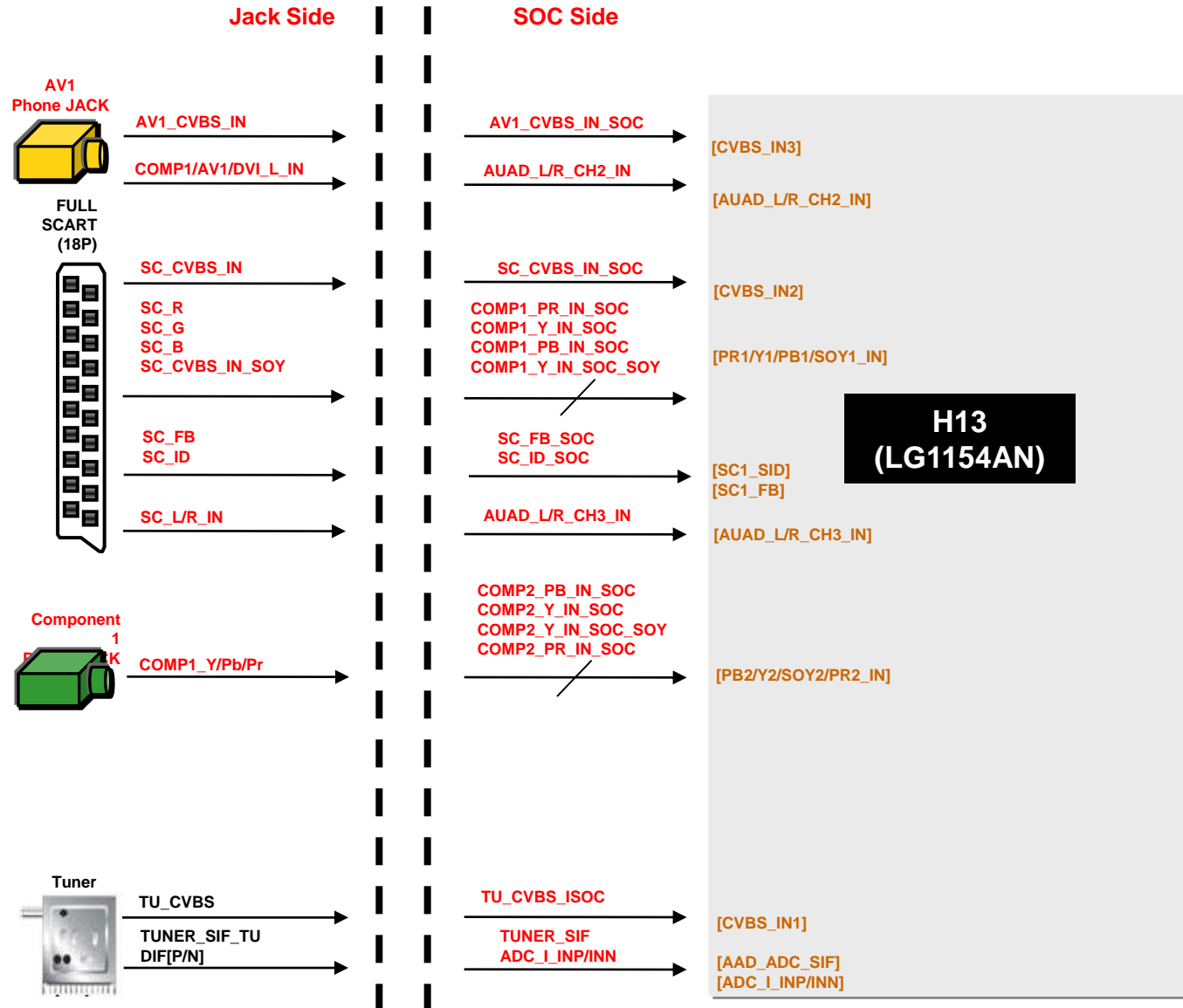
3. Power Block Diagram



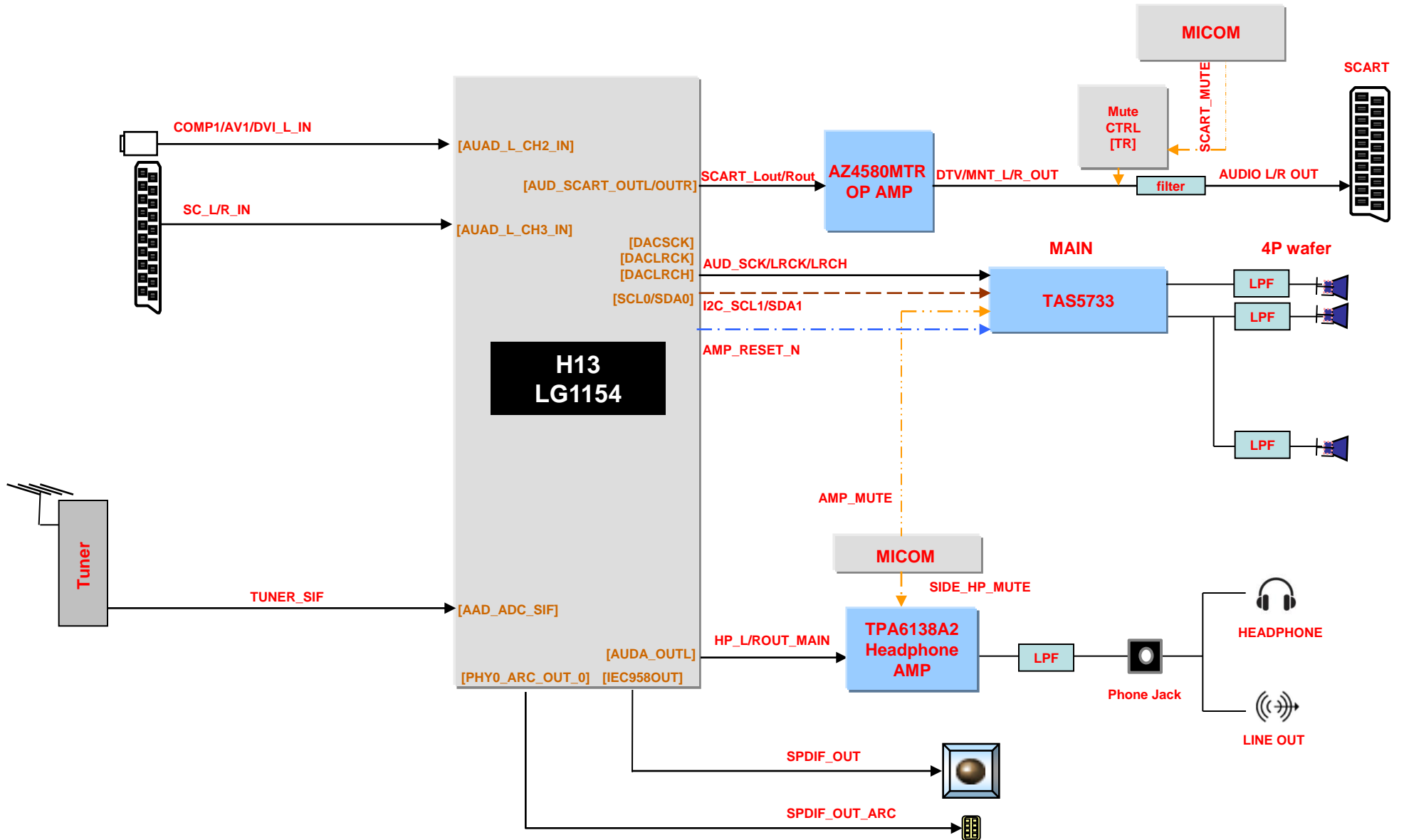
4. Tuner/CI Block Diagram



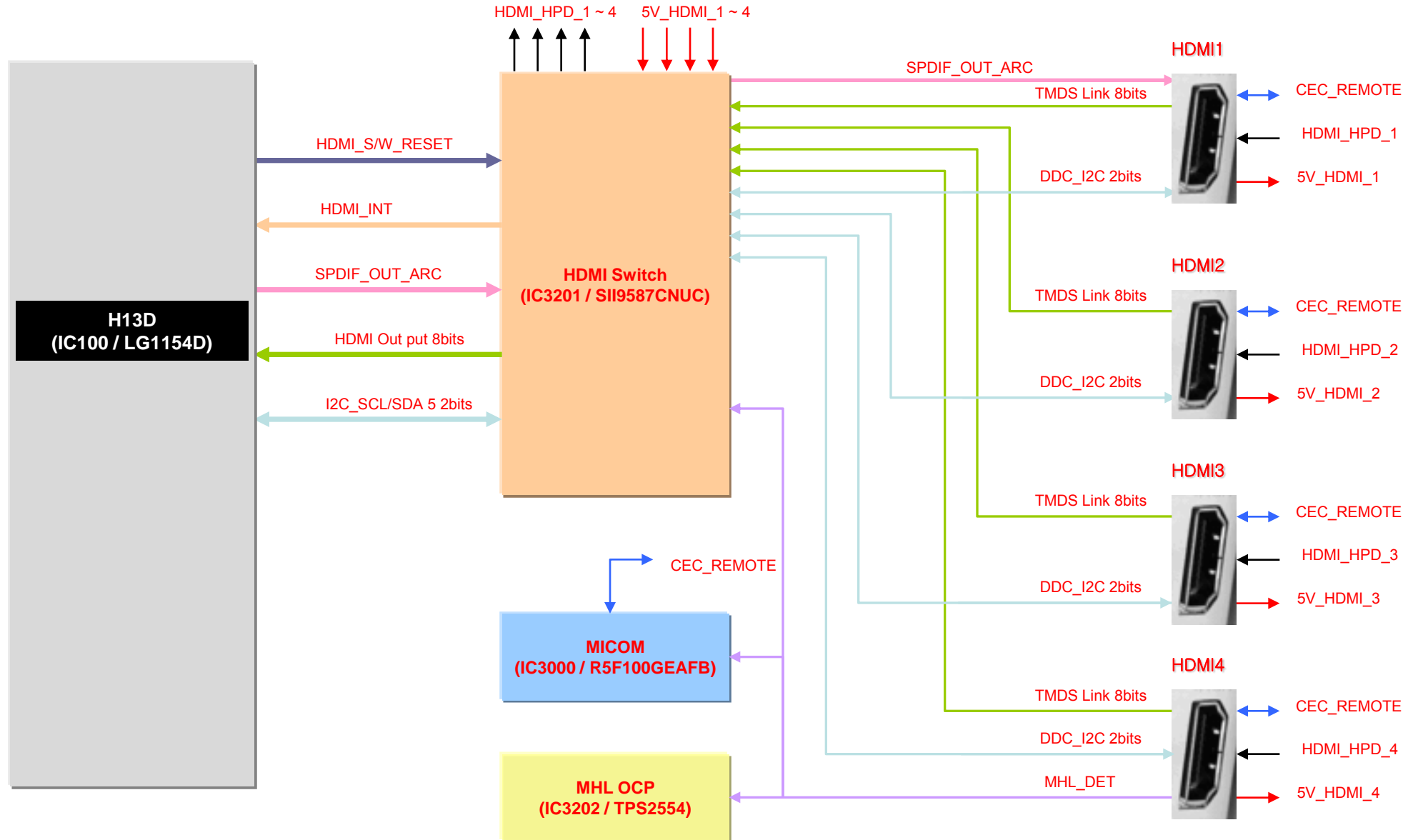
5. Video & Audio IN



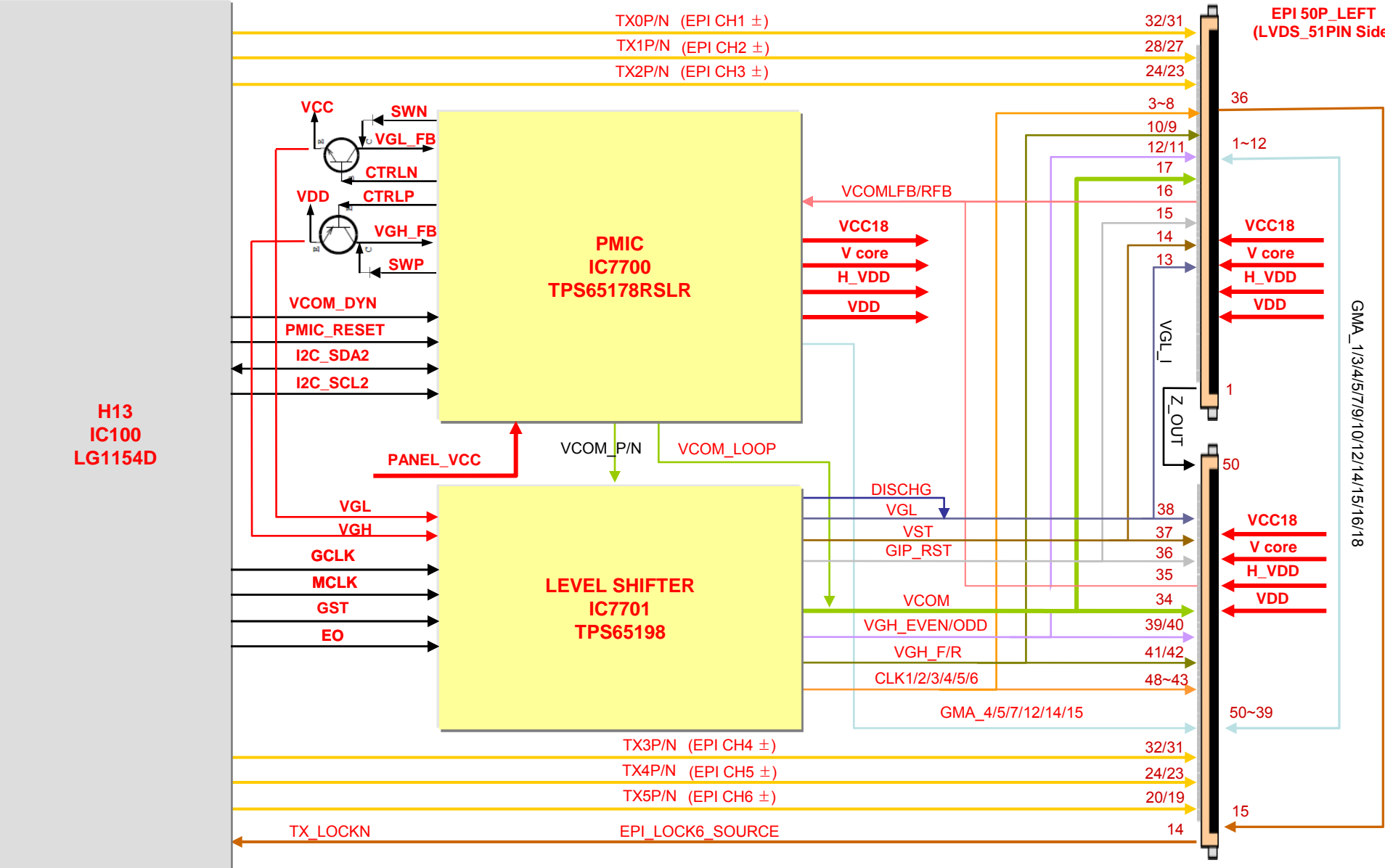
6. AUDIO OUT



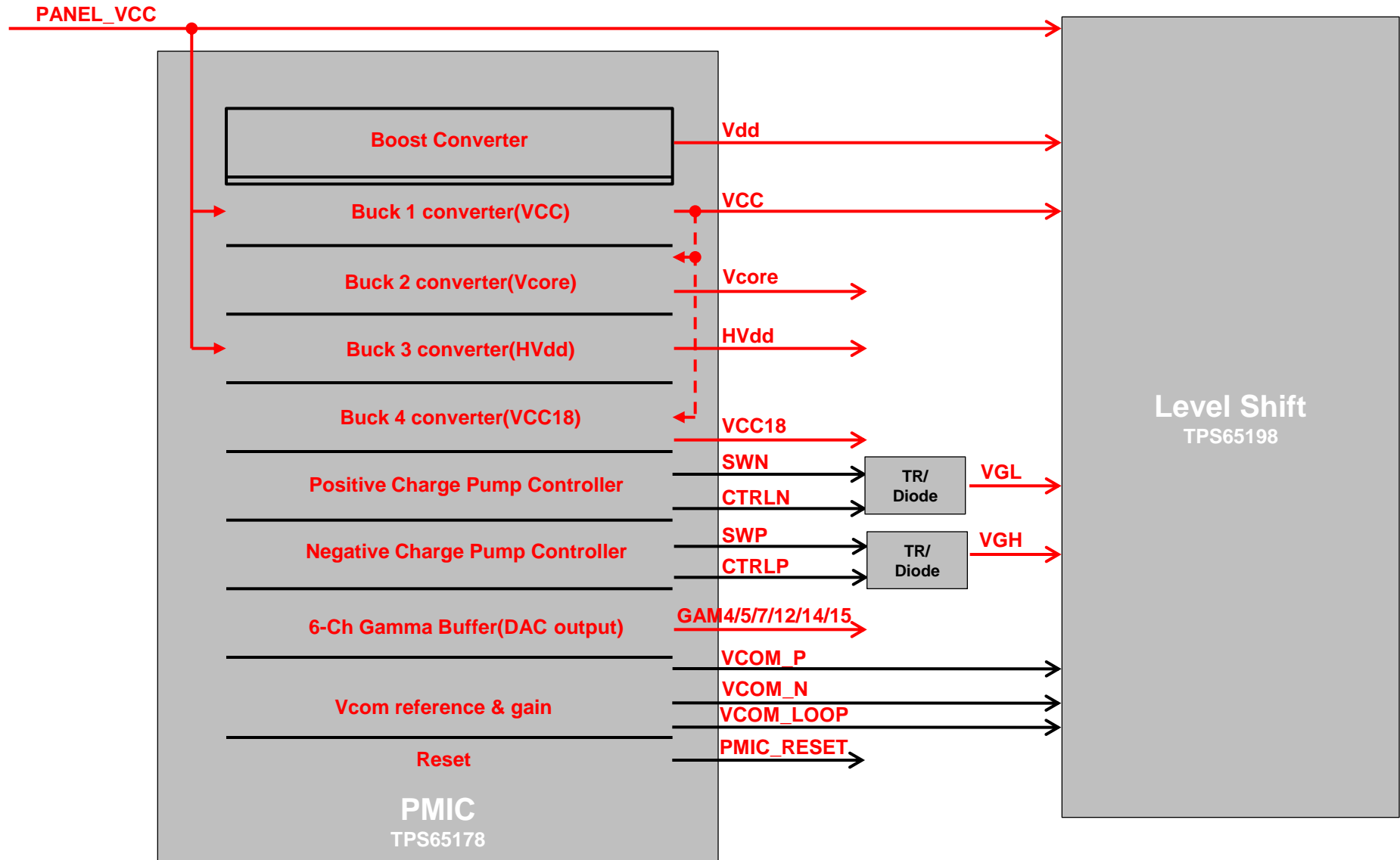
7. HDMI



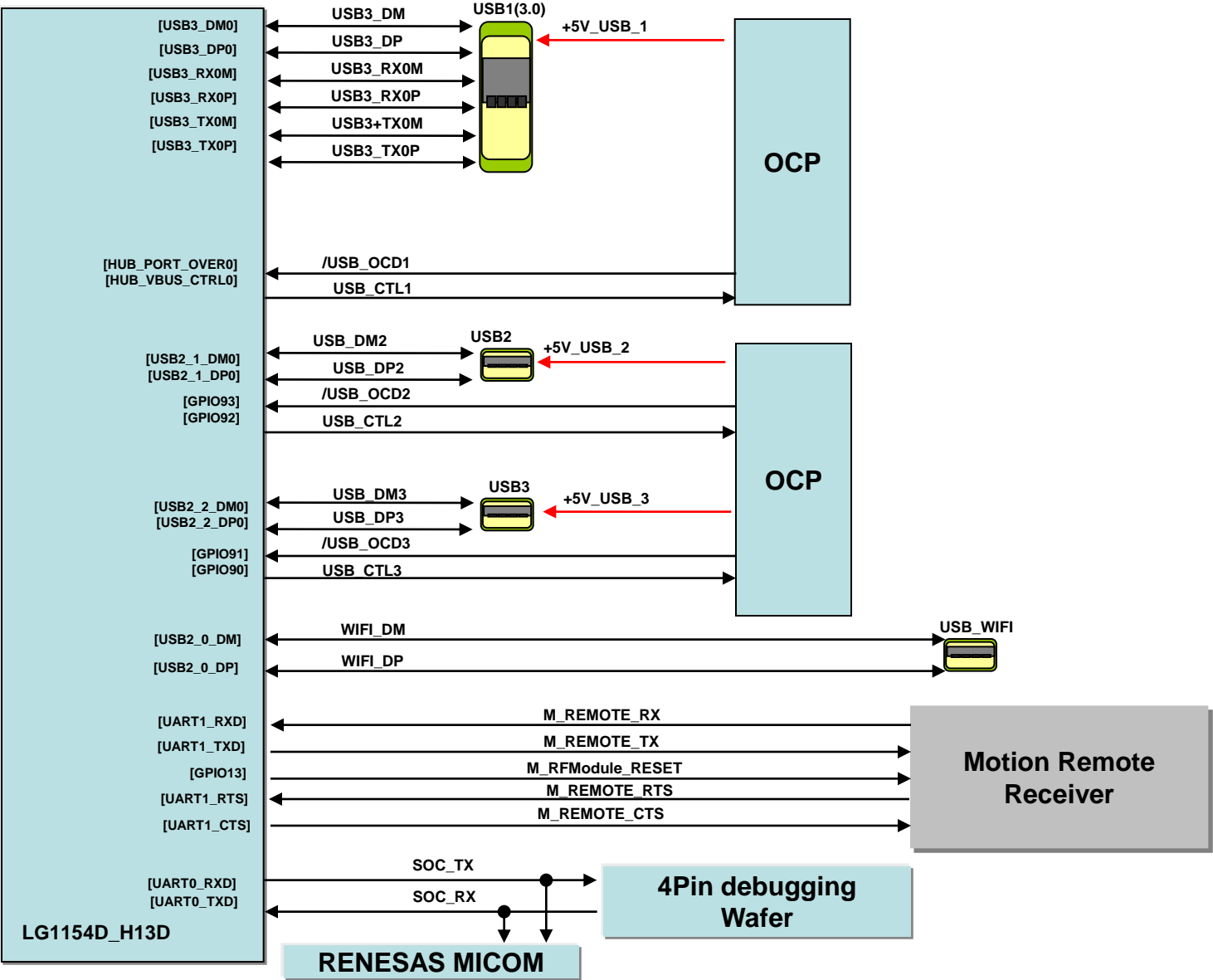
8. Panel Interface Block Diagram



9. PMIC & Level Shift Bloc Diagram

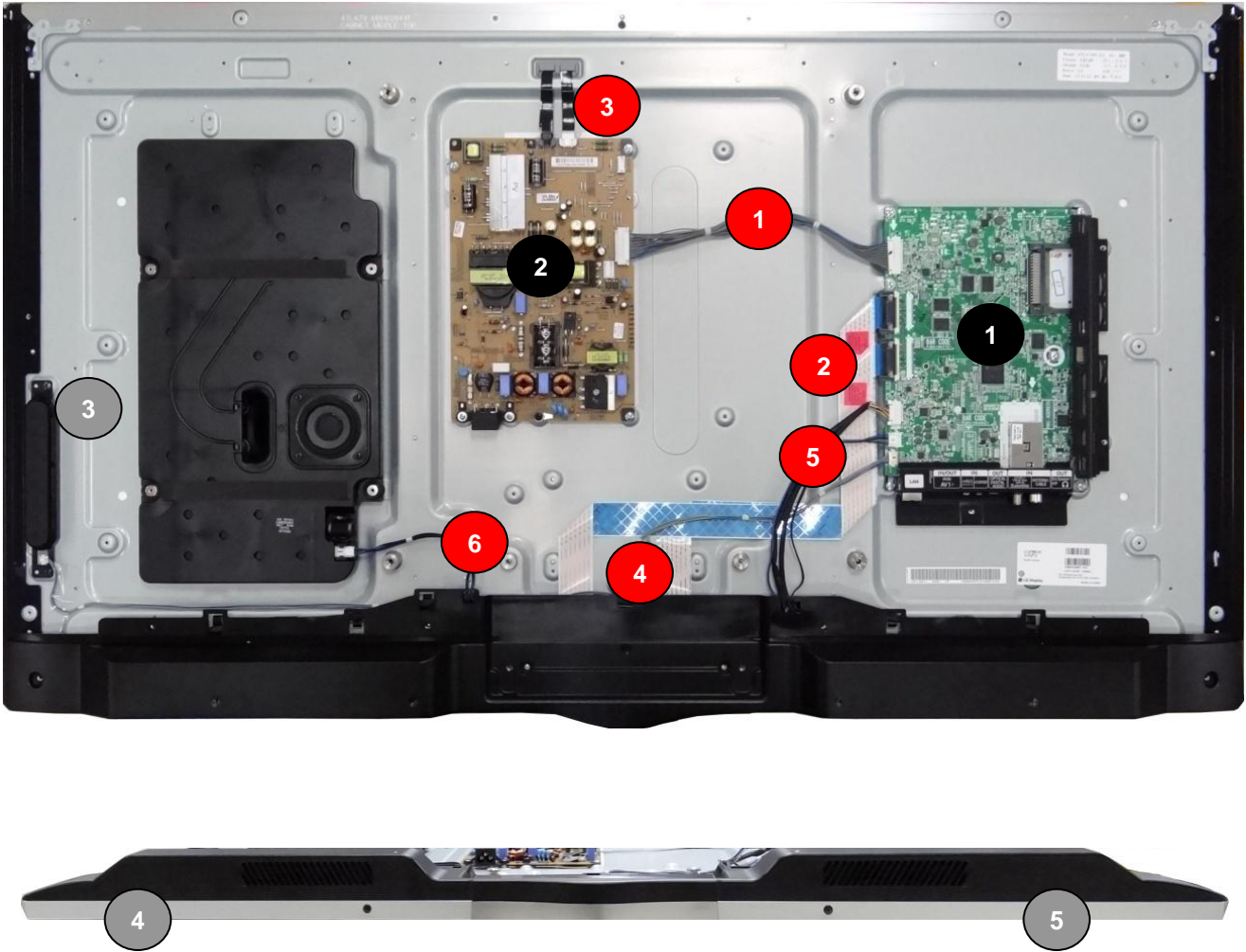


10. USB / WIFI / M-REMOTE / UART



Interconnection - 1

47LA790V-ZA



[PCBs]

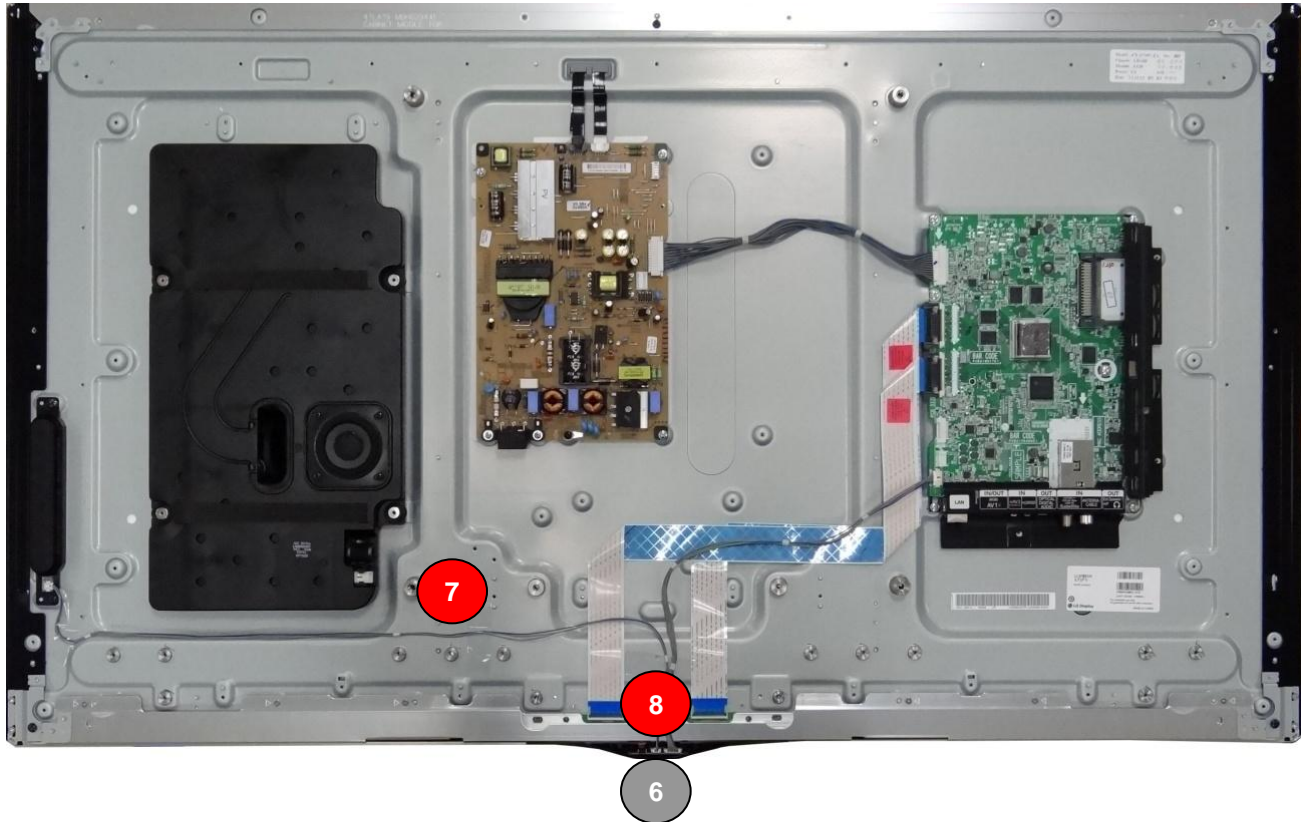
- 1 Main PCB
- 2 Power Board
- 3 Local key Assy
- 4 RF Assy
- 5 WIFI Assy

[Cables]

- 1 Main / LPB 24Pin + Local Dimming Cable
- 2 Main / Module EPI Cable 50& 50Pin
- 3 LED driver / PSU
- 4 IR 8Pin Cable
- 5 WiFi 6Pin + RF 8Pin Cable
- 6 SPK Cable

Interconnection - 2

47LA790V-ZA



[PCBs]

6 IR Assy

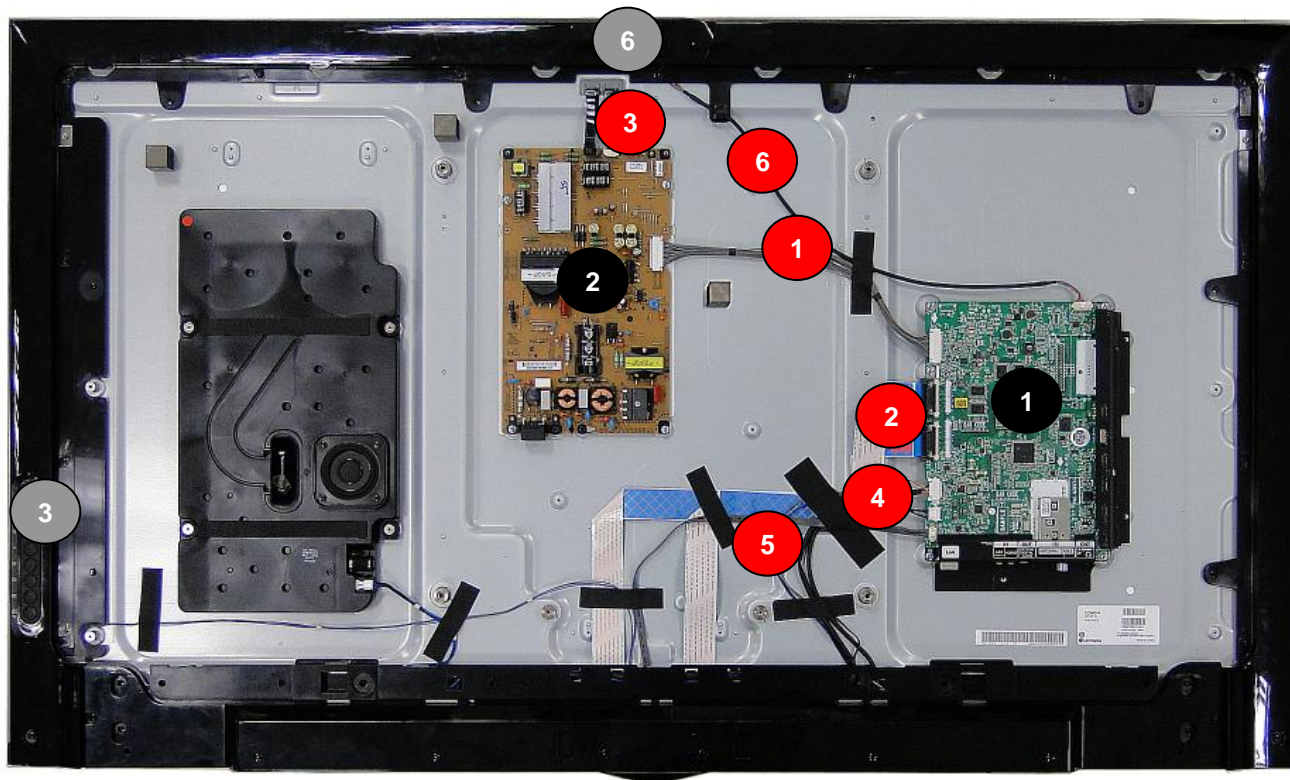
[Cables]

7 IR to Local Key 3Pin Cable

8 IR to Logo Assy 4Pin Cable

Interconnection - 1

55LA860V-ZA

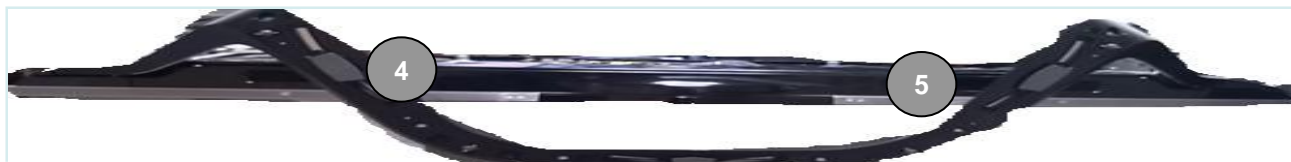


[PCBs]

- 1 Main PCB
- 2 Power Board
- 3 Local key Assy
- 4 RF Assy
- 5 WIFI Assy
- 6 Camera Assy

[Cables]

- 1 Main / LPB 24Pin + Local Dimming Cable
- 2 Main / Module EPI Cable 50& 50Pin
- 3 LED driver / PSU
- 4 WiFi 6Pin + RF 8Pin Cable
- 5 SPK Cable
- 6 Camera Cable



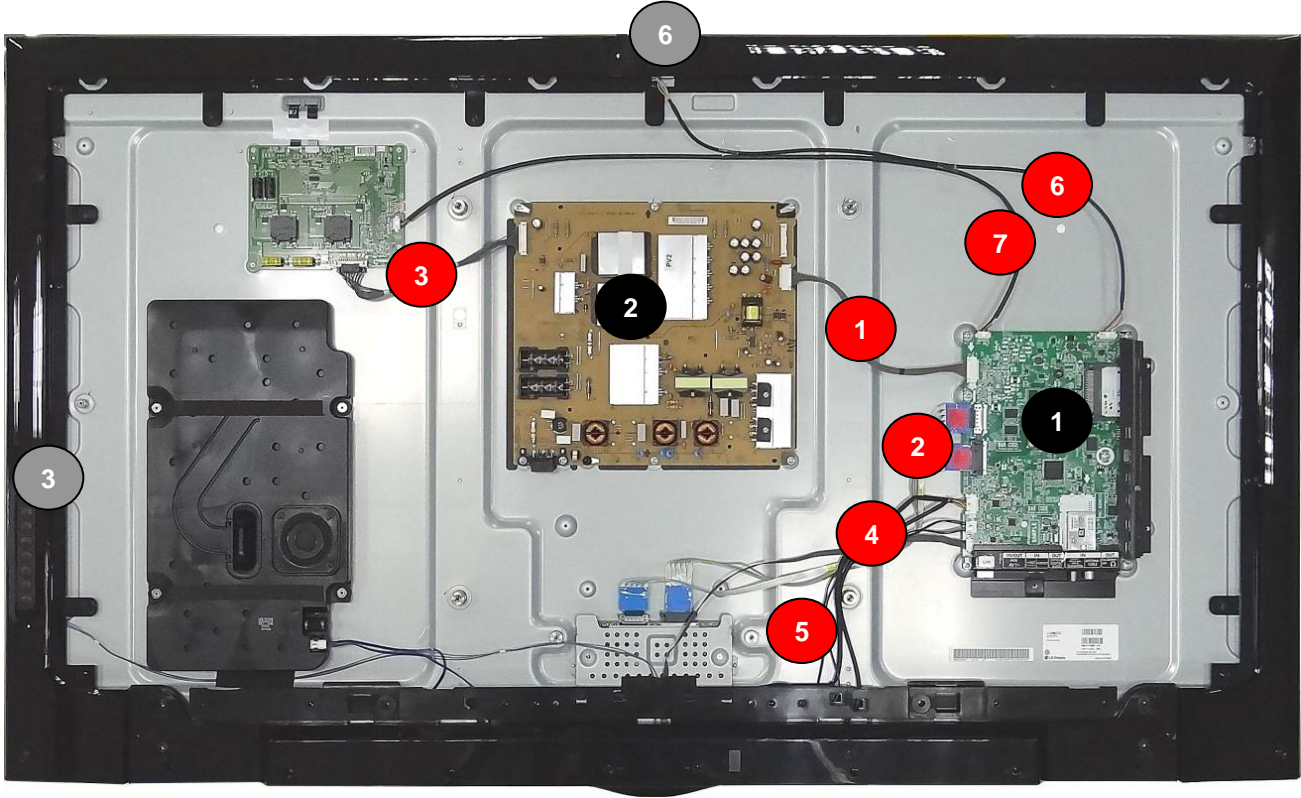
7) IR Assy

7 IR to Local Key 3Pin Cable

8 IR cable

Interconnection - 1

60LA860V-ZA



[PCBs]

- 1 Main PCB
- 2 Power Board
- 3 Local key Assy
- 4 RF Assy
- 5 WIFI Assy
- 6 Camera Assy

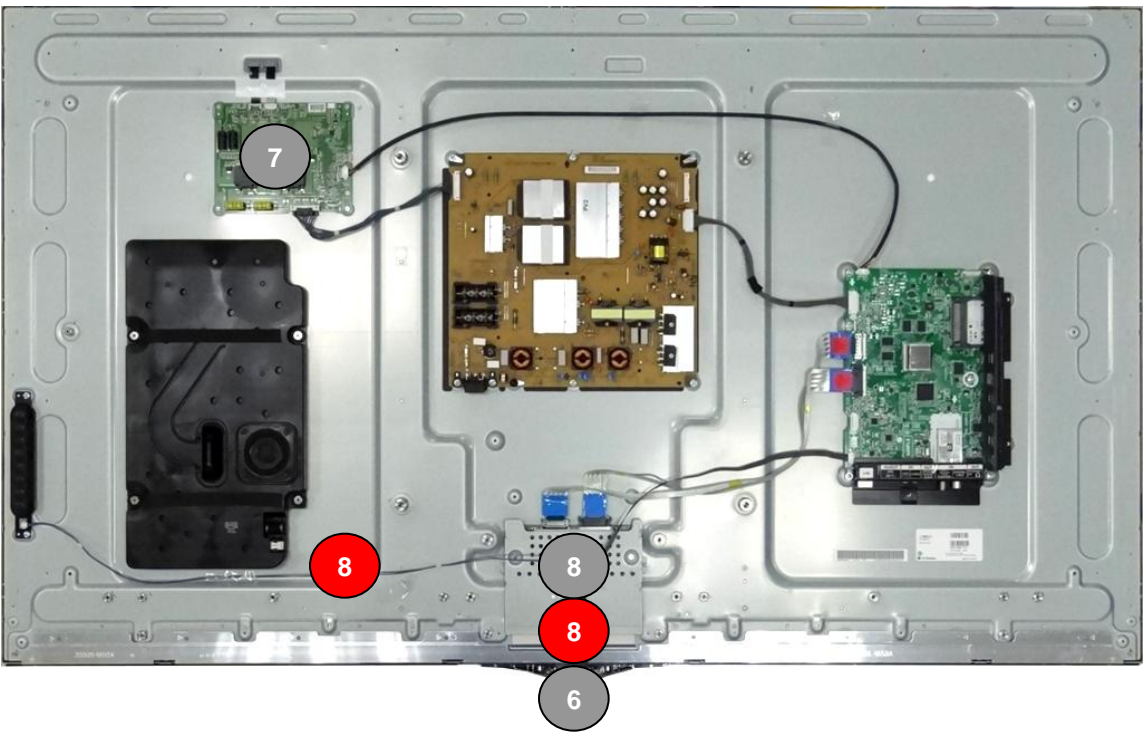
[Cables]

- 1 Main / PSU 18Pin
- 2 Main / T-con LVDS Cable 41& 51Pin
- 3 LED driver 14 Pin cable
- 4 WiFi 6Pin + RF 8Pin Cable
- 5 SPK Cable
- 6 Camera Cable
- 7 Local Dimming cable



Interconnection - 2

60LA860V-ZA



[PCBs]

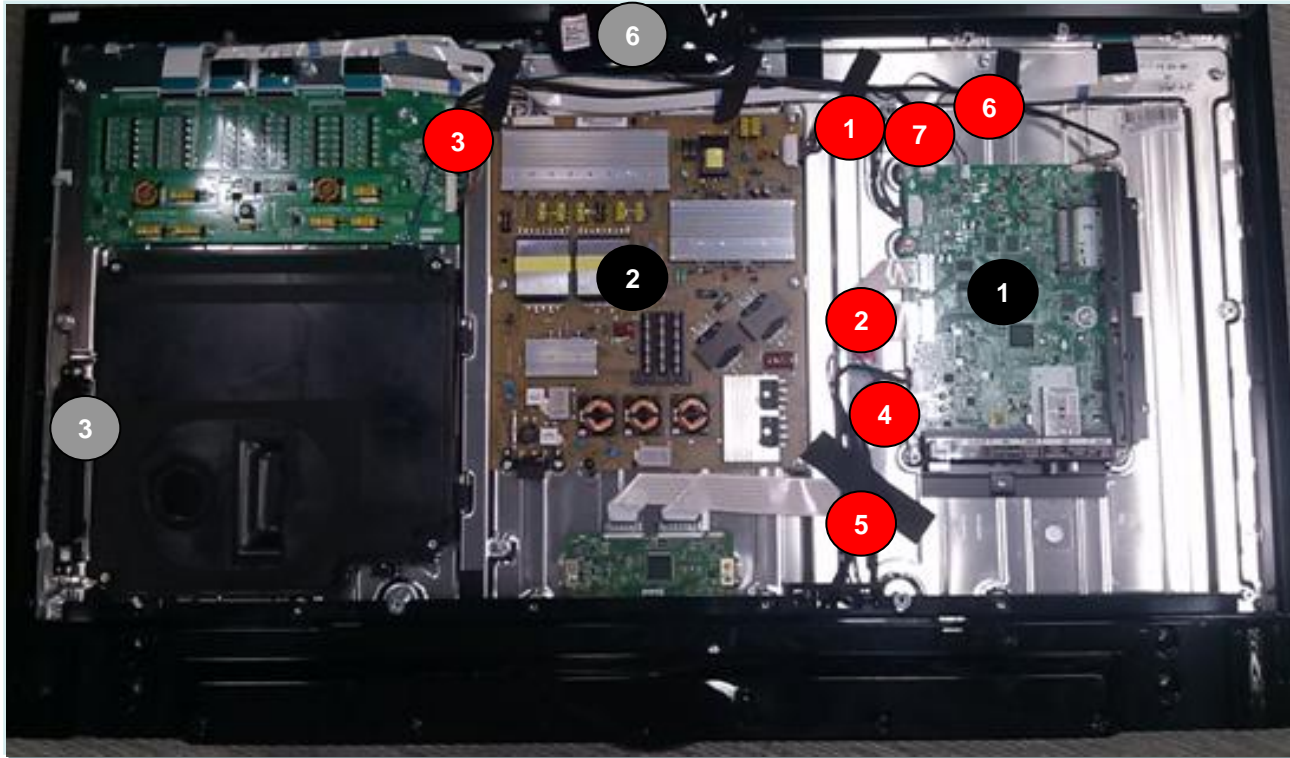
- 6 IR Assy
- 7 LED Driver
- 8 T-con

[Cables]

- 8 IR to Local Key 3Pin Cable
- 9 IR 8 Pin Cable

Interconnection - 1

47LA960V-ZA



[PCBs]

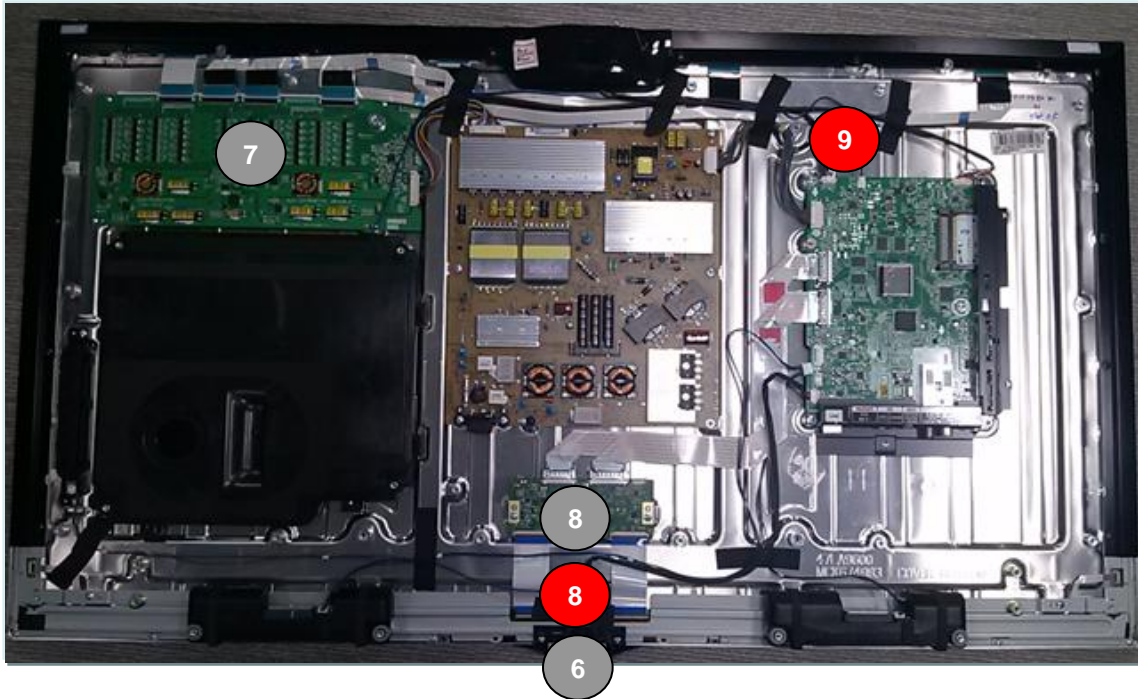
- 1 Main PCB
- 2 Power Board
- 3 Local key Assy
- 4 RF Assy
- 5 WIFI Assy
- 6 Camera Assy

[Cables]

- 1 Main / PSU 18Pin
- 2 Main / T-con LVDS Cable 41& 51Pin
- 3 LED driver 14 Pin Cable
- 4 WiFi 6Pin + RF 8Pin Cable
- 5 SPK Cable
- 6 Camera Cable
- 7 Local Dimming cable

Interconnection - 2

47LA960V-ZA



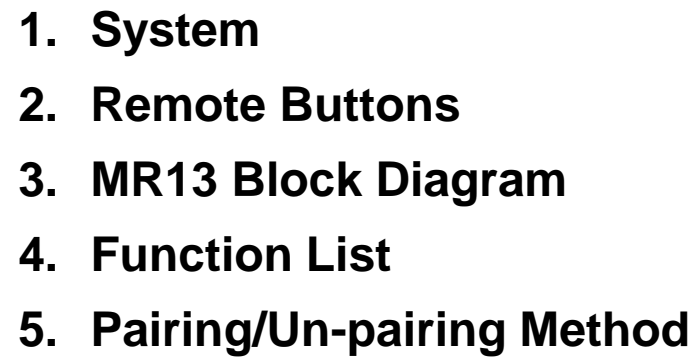
[PCBs]

- 6 IR Assy
- 7 LED Driver
- 8 T-con

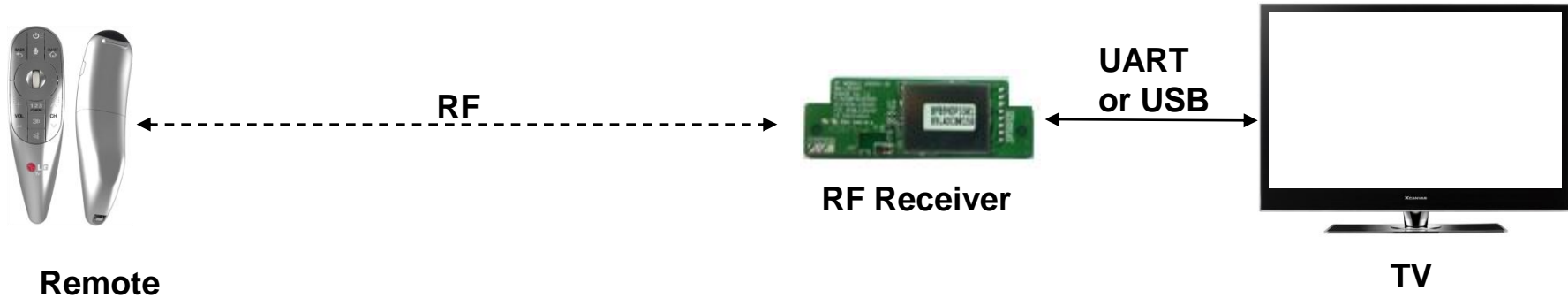
[Cables]

- 8 IR 5 Pin + Local Key 3 Pin Cable
- 9 Woofer Cable

Introductions of 13Y RF ass'y + Magic Remote control

- 
- 1. System**
 - 2. Remote Buttons**
 - 3. MR13 Block Diagram**
 - 4. Function List**
 - 5. Pairing/Un-pairing Method**

1. System



❖ **Pairing Information Transmission (Send to TV after Paired)**

- Static Calibration Data (Bypass only)
- Remote FW ver. (Save also in Receiver)
- BD_ADDR (Save also in Receiver)

• **Pairing Information Transmission Sequence**

- When it is paired, the remote sends packets(pairing success, F/W version, BD_ADDR) to the receiver.
- The receiver sends the pairing success packet to TV directly.
- F/W version and BD_ADDR packets are just saved on the receiver.
- The receiver sends F/W version or BD_ADDR packet to TV when it is required.

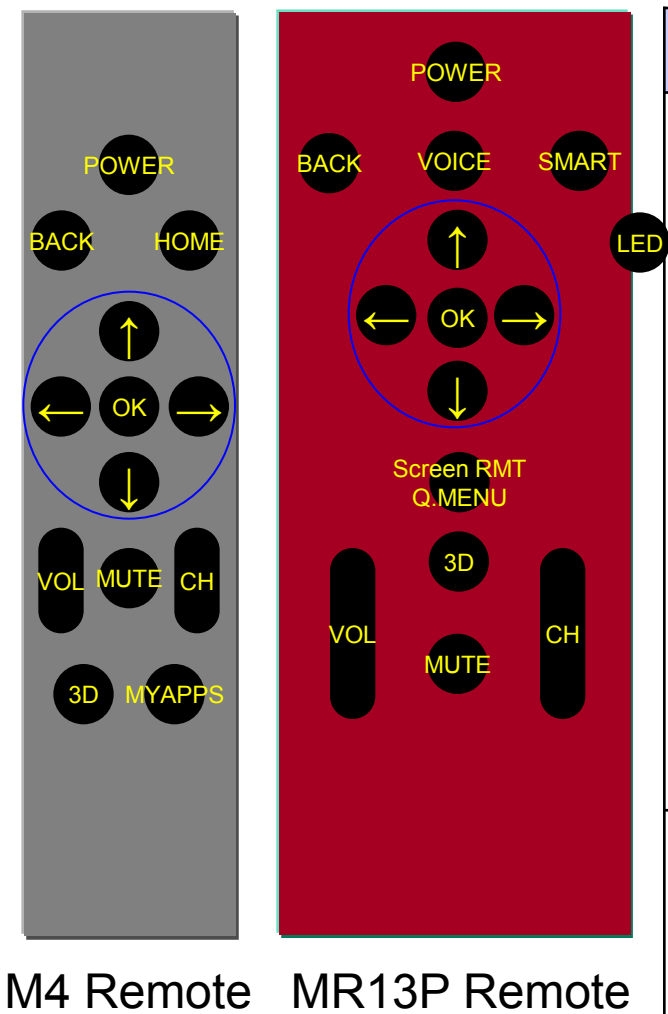
❖ **Motion Data Transmission**

- Period : 7.5msec
- Motion Data : gyro, accelerometer

❖ **Voice Data Transmission**

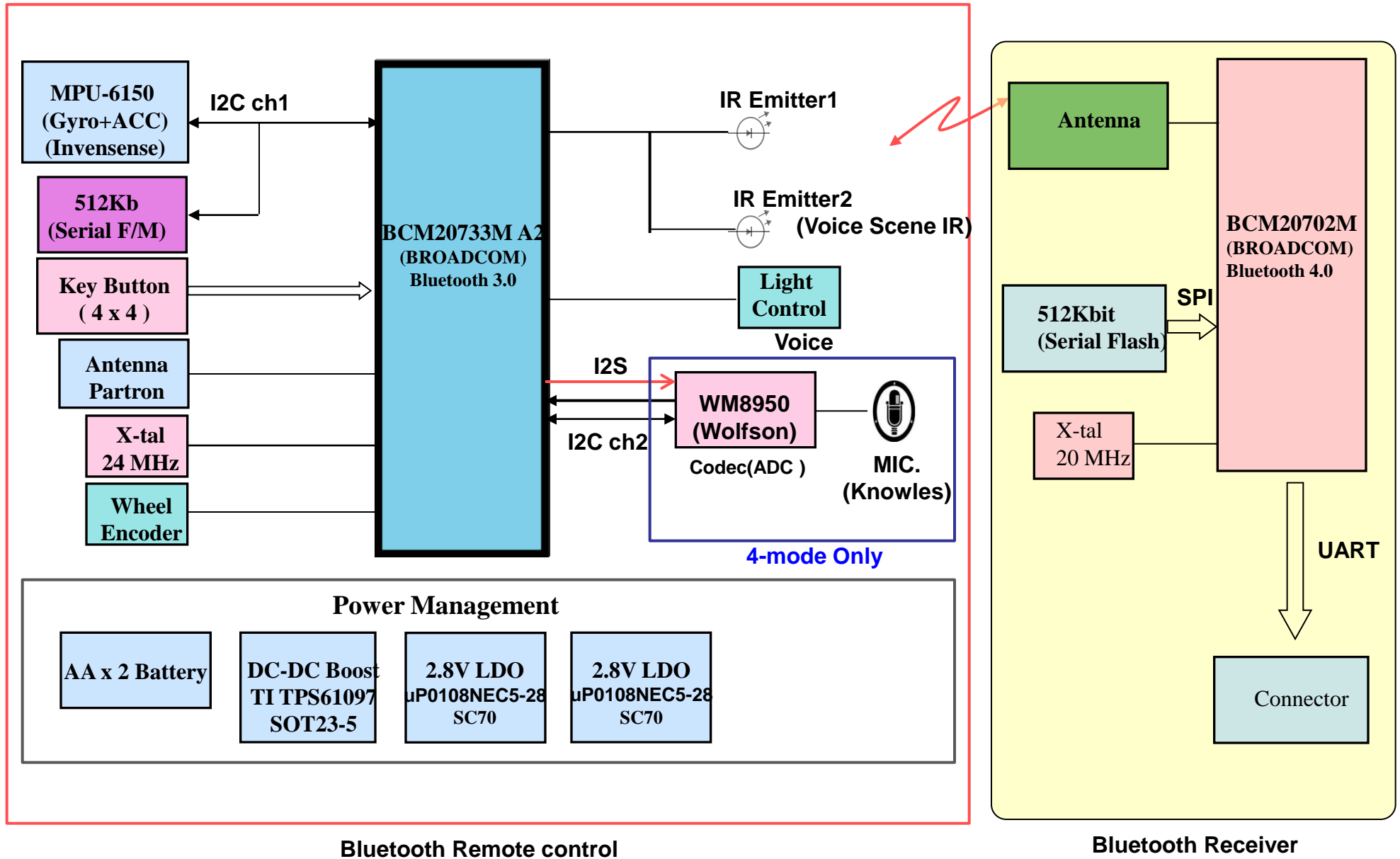
- Period : 10msec
- Voice sampling : 16khz 16bit

2. Remote Buttons (M4 vs. MR13P)



BUTTON		RF Unpaired IR_CODE	RF Paired RF_CODE	IR continuous repeat	ETC.
Phisical Buttons	POWER	0x08	NONE	Y	IR only
	BACK	0x28	0x8028	Y	
	SMART	0x7C	0x807C	Y	
	←	0x07	0x8007	Y	
	→	0x06	0x8006	Y	
	↑	0x40	0x8040	Y	
	↓	0x41	0x8041	Y	
	OK	0x75	0x8044	Y	
	VOICE	0xDE	0x808B	Y	= VOICE_START
	3D	0xDC	0x80DC	Y	
	Screen RMT / Q.MENU	0xDE	0x80DE	Y	
	CH +	0x00	0x8000	Y	
	CH -	0x01	0x8001	Y	
	VOL +	0x02	0x8002	Y	
	VOL -	0x03	0x8003	Y	
	MUTE	0x09	0x8009	Y	
Logical Buttons	AUTO_WAKEUP	X	0x800C		
	VOICE_START	X	0x800A		
	VOICE_STOP	X	0x800D		
	POINT_START	X	0x803E		
	POINT_STOP	X	0x803F		

3. MR13P Block Diagram



4. Function list

주요 Item			IC	Manufacturer	Function
Remocon	Voice	Voice Codec	WM8950	Wolfson	16KHz Sampling of Audio data
		MEMS Mic.	SPU0414HR5H	Knowles	Sensing Voice
	Motion Sensor	Gyro Sensor + Accelerometer	MPU-6150	Invensense	Sensing angular velocity of X, Y, Z-axis
					Sensing device tilt (Pitch & Roll angle)
	RF + Micom	RF Antenna	SDBTPTR3015	Partron	Wireless communication
		X-tal	24MHz	Partron	
		RF + Micom	BCM20733A2	Broadcom	
	DC-DC Converter		TPS61097	TI	Battery Boost up Regulator
	LDO1		uP0108NEC5-28	uPI	RF, Gyro, Accelerometer Power Supply
	LDO2		uP0108NEC5-28	uPI	Audio Codec, Mic. Power Supply

5. RF Pairing / Un-pairing Method

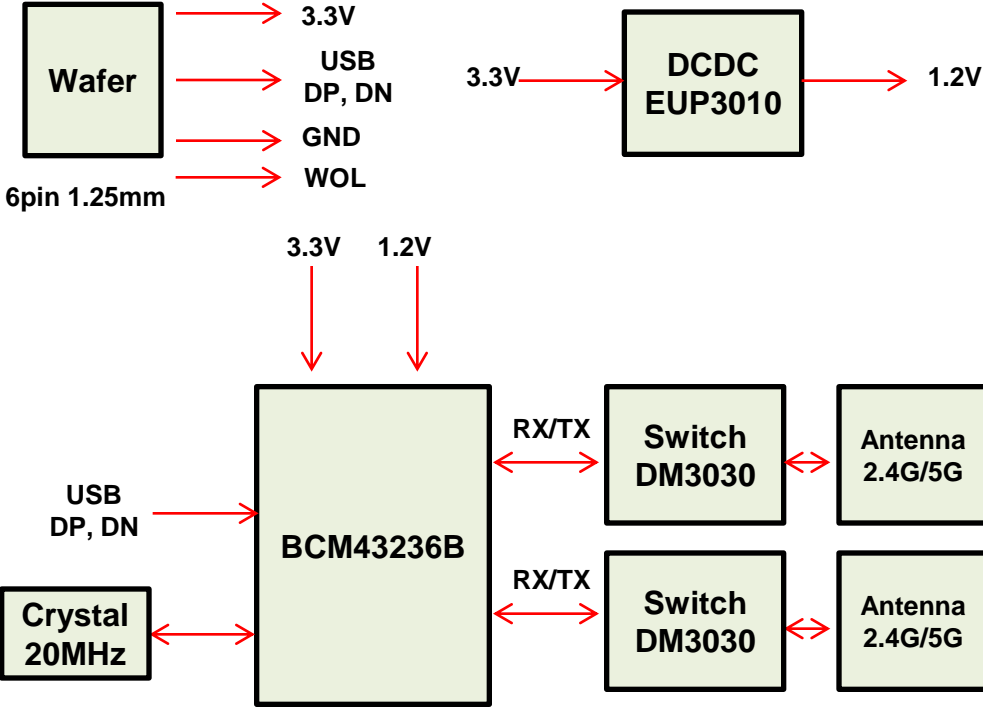
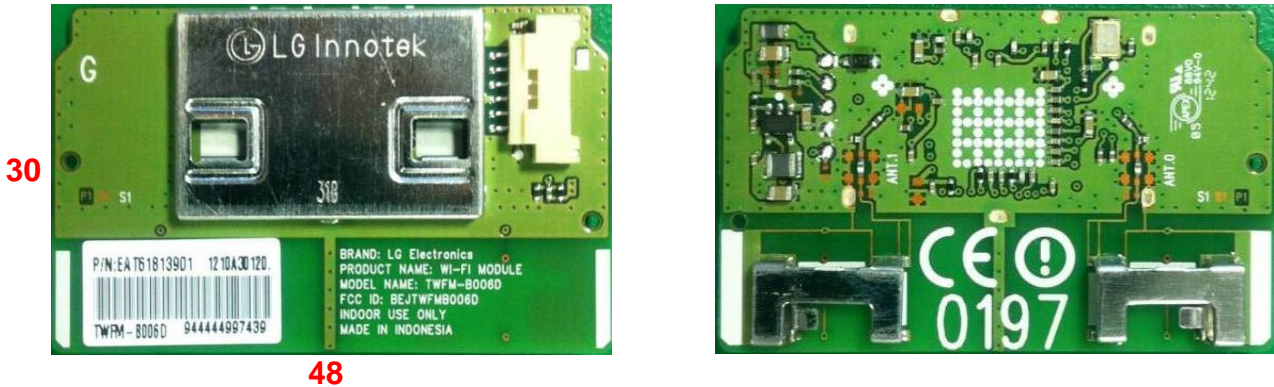
	Method	Description
RF Pairing	<ul style="list-style-type: none">❖ Method1<ul style="list-style-type: none">– If unpaired, just press "OK" button.– If paired, press "OK" button after unpairing.❖ Method 2 (Repairing)<ul style="list-style-type: none">– Press "BACK" button for 5 sec.	<ul style="list-style-type: none">• When do pairing, the remote should make pairing request IR signal(0x75) to TV.• When TV receive the IR signal, it should send "pairing request packet" to the RF receiver.• After pairing success, the remote should blink LED for some time and TV send "pairing success packet" back to TV.• When remote try to unpairing, it doesn't care about state of receiver(stand alone).
RF Unpairing	Press "BACK" button and "SMART" button at the same time for 5 sec.	<ul style="list-style-type: none">• When remote try to unpairing, it doesn't care about state of receiver(stand alone).• After unpairing, all pairing information should be erased.• After unpairing, LED should be blinked for 3sec.• The remote just becomes to IR mode.

Introductions of 13Y WIFI built in ass'y

- 
- 1. Wi-Fi built in Ass'y feature**
 - 2. Wi-Fi built in Ass'y specification**

WIFI Built in ass'y feature

Block diagram



- Pin map

PIN	USB interface
1	Vcc
2	DM
3	DP
4	GND
5	WOW
6	NC

WiFi Built in ass'y Specification

- ◆ Frequency Band:

Draft 802.11n Radio: 2.4 GHz

802.11g Radio: 2.4 GHz

802.11b Radio: 2.4 GHz

USA – FCC

2412~2462MHz (Ch1~Ch11)

Canada – IC

2412~2462MHz (Ch1~Ch11)

Europe – ETSI

2412~2472MHz (Ch1~Ch13)

Japan – STD-T66/STD-33

2412~2484MHz (Ch1~Ch14)

802.11a Radio : 5 GHz

5.150~5.250GHz

5.725~5.850GHz

- ◆ Operating Channels:

IEEE 802.11b/g/n compliant:

11 channels (US, Canada)

13 channels (ETSI)

14 channels (Japan)

- ◆ Transmit Power and Sensitivity:

TX Output Power:(Typical) (Meet emission standard)

11b 17 +/- 2 dBm

11g 14 +/- 2 dBm@54Mbps (Each chain)

11n 13 +/- 2 dBm (Each chain)

Rx Sensitivity:(Typical)

-69dBm at HT20 m7 2.4GHz

-87dBm at HT20 m0 2.4GHz

-69dBm at HT20 m7 5.0GHz

-87dBm at HT20 m0 5.0GHz

- ◆ Modulation

DBPSK @1Mbps

DQPSK@2Mbps

CCK@5.5/11Mbps

BPSK@6/9 Mbps

QPSK@12/18Mbps

16-QAM@24Mbps

64-QAM@48/54Mbps and above

- ◆ Current consumption(5V DC):

Full load: 430mA

- ◆ Operating Temperature: 0 ~ 60 °C ambient

- ◆ Storage Temperature: -20 ~ 60 °C ambient

- ◆ Humidity: under 85% and must be non-condensing

- ◆ Regulation and certification compliance available:

- ◆ CE

- ◆ FCC

- ◆ WiFi



- ◆ WPS



Contents of LCD TV Standard Repair Process

No.	Error symptom (High category)	Error symptom (Mid category)	Page	Remarks
1	A. Video error	No video/Normal audio	1	
2		No video/No audio	2	
3		Video error, video lag/stop, fail tuning	3, 4	
4		Color error	5	
5		Vertical/Horizontal bar, residual image, light spot, external device color error	6	
6	B. Power error	No power	7	
7		Off when on, off while viewing, power auto on/off	8	
8	C. Audio error	No audio/Normal video	9	
9		Wrecked audio/discontinuation/noise	10	
10	D. Function error	No response in remote controller, key error, recording error, memory error	11	
11		External device recognition error	12	
12	E. Noise	Circuit noise, mechanical noise	13	
13	F. Exterior error	Exterior defect	14	
14	G. Network error	Connection defect / Network speed low	15	

First of all, Check whether there is SVC Bulletin in GCSC System for these model.

Contents of LCD TV Standard Repair Process Detail Technical Manual

No.	Error symptom	Content	Page	Remarks
1	A. Video error_ No video/Normal audio	Check LCD back light with naked eye	A1	
2		LED driver B+ 24V measuring method	A2	
3		Check White Balance value	A3	
4		Power Board voltage measuring method	A4	
6	A. Video error_ No video/Video lag/stop	TUNER input signal strength checking method	A6	
7		LCD-TV Version checking method	A7	
9	A. Video error_Color error	LCD TV connection diagram	A8	
10		Tuner Checking Part	A9	
11		Check Link Cable (LVDS) reconnection condition	A10 A11	A10 : 32/37/42/47/55 A11 : 32 AUO
12		Adjustment Test pattern – ADJ Key	A12	
13	A. Video error_Vertical/Horizontal bar, residual image, light spot	LCD TV connection diagram	A8	
14		Check Link Cable (LVDS) reconnection condition	A10 A11	A10 : 32/37/42/47/55 A11 : 32 AUO
15		Adjustment Test pattern – ADJ Key	A12	
16	<Appendix> Defected Type caused by T-Con/ Inverter/ Module	Exchange T-Con Board (1)	A-1/5	
17		Exchange T-Con Board (2)	A-2/5	
18		Exchange LED driver Board (PSU)	A-3/5	55" : driver board Other : PSU
19		Exchange Module itself (1)	A-4/5	
20		Exchange Module itself (2)	A-5/5	

Continue to the next page

Standard Repair Process

LCD TV

Error symptom

A. Video error

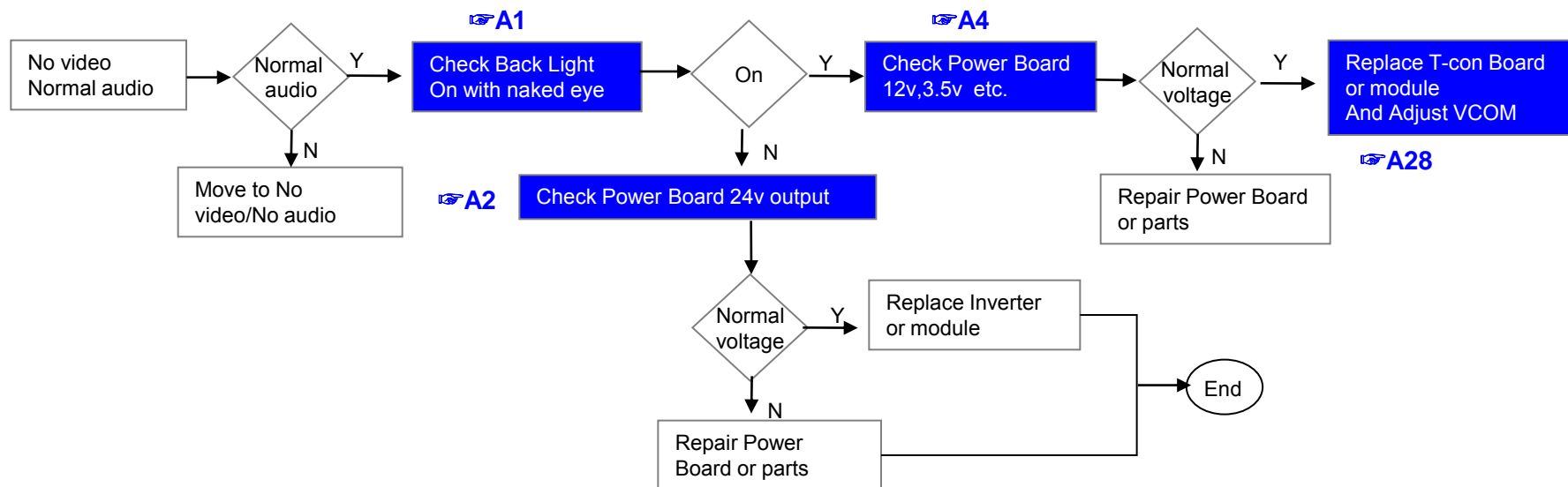
Established date

2012. 12 .06

No video/ Normal audio

Revised date

First of all, Check whether all of cables between board is inserted properly or not.
(Main B/D↔ Power B/D, LVDS Cable,Speaker Cable,IR B/D Cable,,,))



※Precaution A7 & A3

Always check & record S/W Version and White Balance value before replacing the Main Board

Replace Main Board

Re-enter White Balance value

Standard Repair Process

LCD TV

Error
symptom

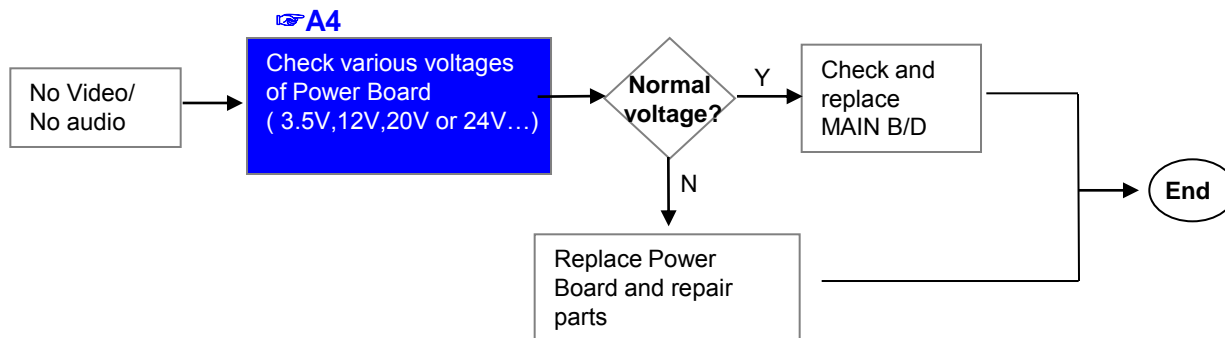
A. Video error

Established
date

2012. 12 .06

No video/ No audio

Revised date



Standard Repair Process

LCD TV

Error symptom

A. Picture Problem

Established date

2012. 12 .06

Picture broken/ Freezing

Revised date

A6

Check RF Signal level

- . By using Digital signal level meter
- . By using Diagnostics menu on OSD
(Menu→ Set up→ Support → Signal Test)
- Signal strength (Normal : over 50%)
- Signal Quality (Normal: over 50%)

Normal Signal?

Y

Check whether other equipments have problem or not.
(By connecting RF Cable at other equipment)
→ DVD Player ,Set-Top-Box, Different maker TV etc`

N

Check RF Cable Connection
1. Reconnection
2. Install Booster

Normal Picture?

N

Contact with signal distributor or broadcaster (Cable or Air)

Y

Close

Normal Picture?

Y

A7

Check S/W Version

SVC Bulletin?

N

Use Signal Test Check Signal status

Normal Picture?

Y

Close

S/W Upgrade

Normal Picture?

N

Close

Check Tuner soldering

Replace Main B/D

Standard Repair Process

LCD TV

Error symptom

A. Picture Problem (DVB-S/S2)

Established date

2012. 12 .06

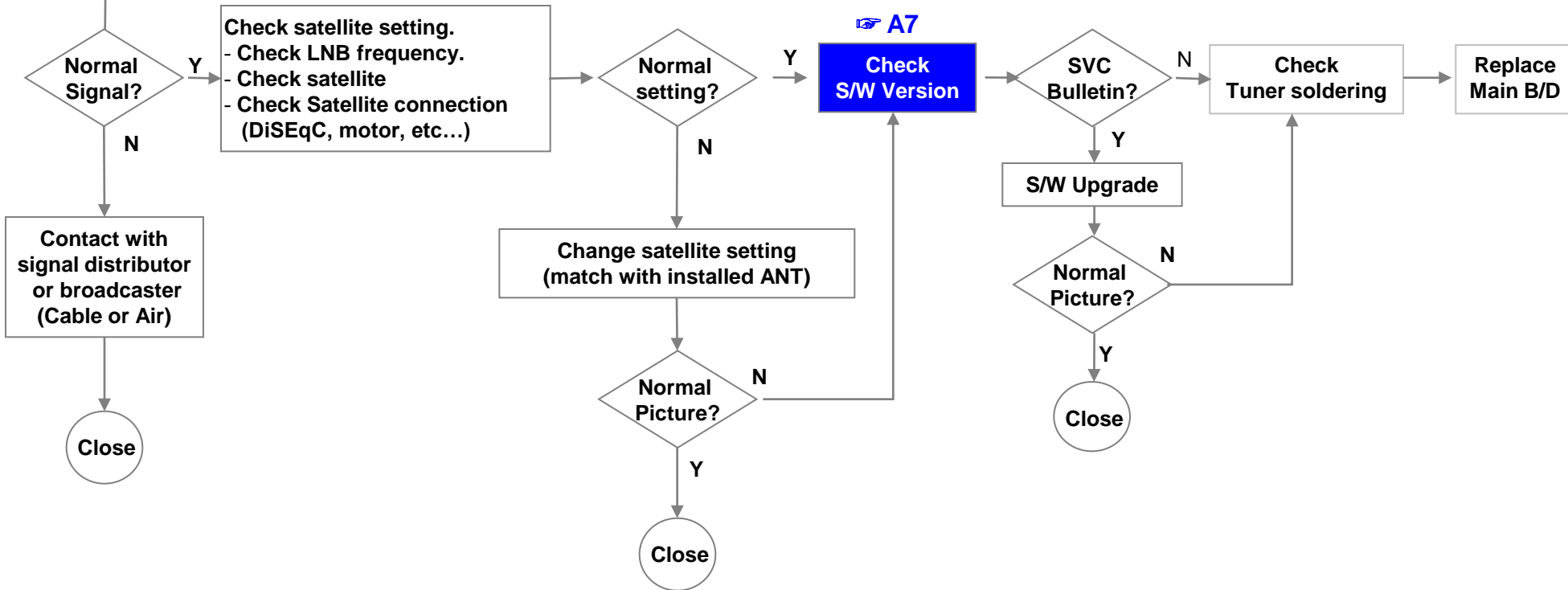
Tuning fail, Picture broken/ Freezing

Revised date

👉 A6

Check RF Signal level

Check RF signal cable (DVB satellite signal or not)
Check whether other equipments have problem or not.
(By connecting RF Cable at other equipment)
→ Set-Top-Box, Different maker TV etc



Standard Repair Process

LCD TV

Error symptom

A. Video error

Established date

2012. 12 .06

Color error

Revised date

A8

Check color by input
-External Input
-COMPONENT
-RGB
-HDMI/DVI

Color error?

A10/ A11

※ Check and replace Link Cable (LVDS) and contact condition

Color error?

Replace Main B/D

Color error?

Replace module

Check error color input mode

End

A12

Check Test pattern

External Input/
Component error

Check external device and cable

External device /Cable normal

Replace Main B/D

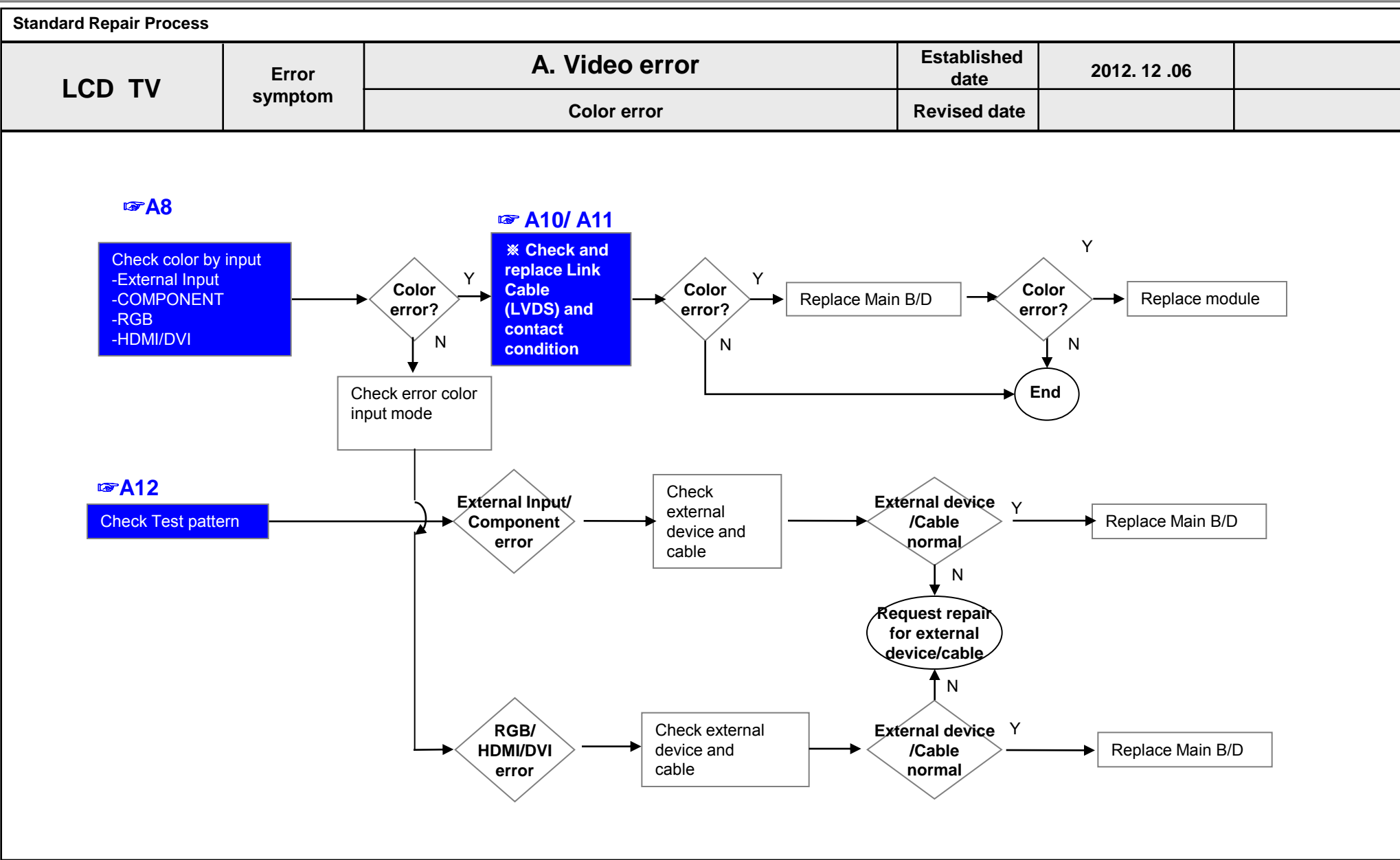
Request repair for external device/cable

RGB/
HDMI/DVI error

Check external device and cable

External device /Cable normal

Replace Main B/D



Standard Repair Process

LCD TV

Error symptom

A. Video error

Established date

2012. 12 .06

Vertical / Horizontal bar, residual image, light spot, external device color error

Revised date

Vertical/Horizontal bar, residual image, light spot

A8

Check color condition by input
-External Input
-Component
-RGB
-HDMI/DVI

Screen normal?

Replace module

Check external device connection condition

Normal?

Request repair for external device

A10/ A11

Check and replace Link Cable

Screen normal?

End

A28

Replace Main B/D (adjust VCOM)

For LGD panel

For other panel

Replace Module

Screen normal?

End

A12

Check Test pattern

External device screen error-Color error

Check S/W Version

Check version

S/W Upgrade

Normal screen?

End

Check screen condition by input
-External Input
-Component
-RGB
-HDMI/DVI

External Input error

Component error

RGB error

HDMI/DVI

Connect other external device and cable
(Check normal operation of External Input, Component, RGB and HDMI/DVI by connecting Jig, pattern Generator, Set-top Box etc.)

Connect other external device and cable
(Check normal operation of External Input, Component, RGB and HDMI/DVI by connecting Jig, pattern Generator, Set-top Box etc.)

Screen normal?

Replace Main B/D

Request repair for external device

Screen normal?

Replace Main B/D

Standard Repair Process

LCD TV

Error symptom

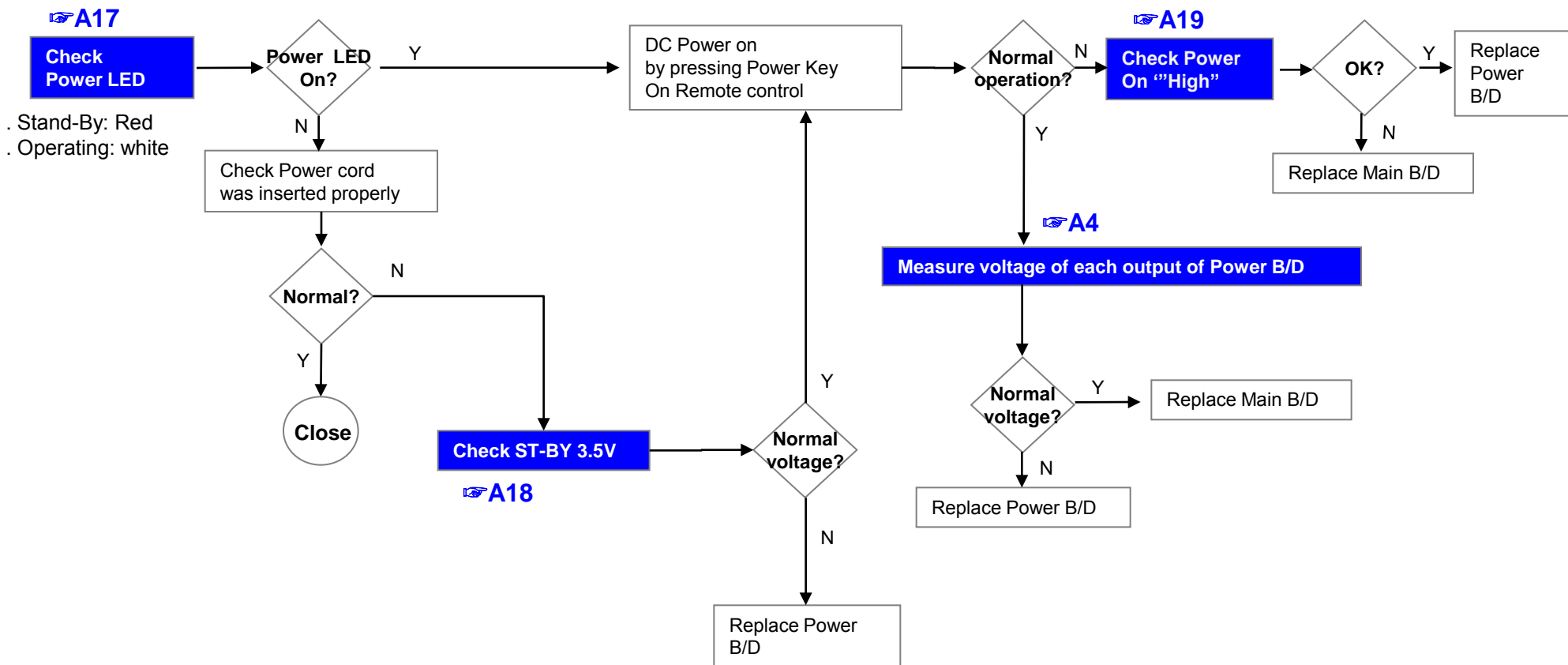
B. Power error

Established date

2012. 12 .06

No power

Revised date



Standard Repair Process

LCD TV

Error symptom

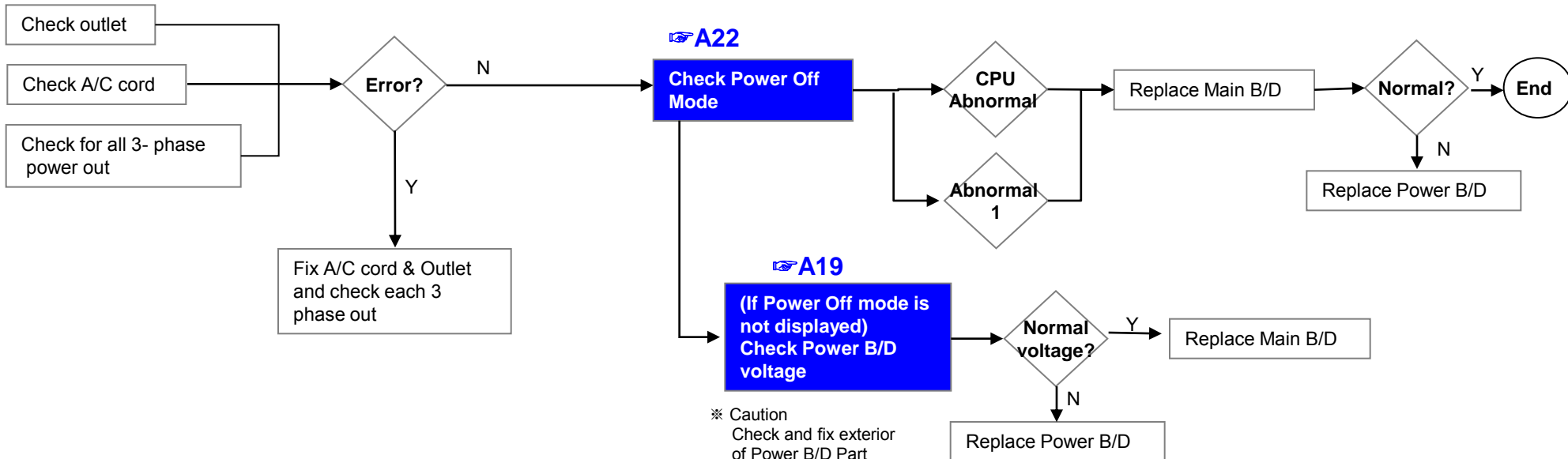
B. Power error

Established date

2012. 12 .06

Off when on, off while viewing, power auto on/off

Revised date

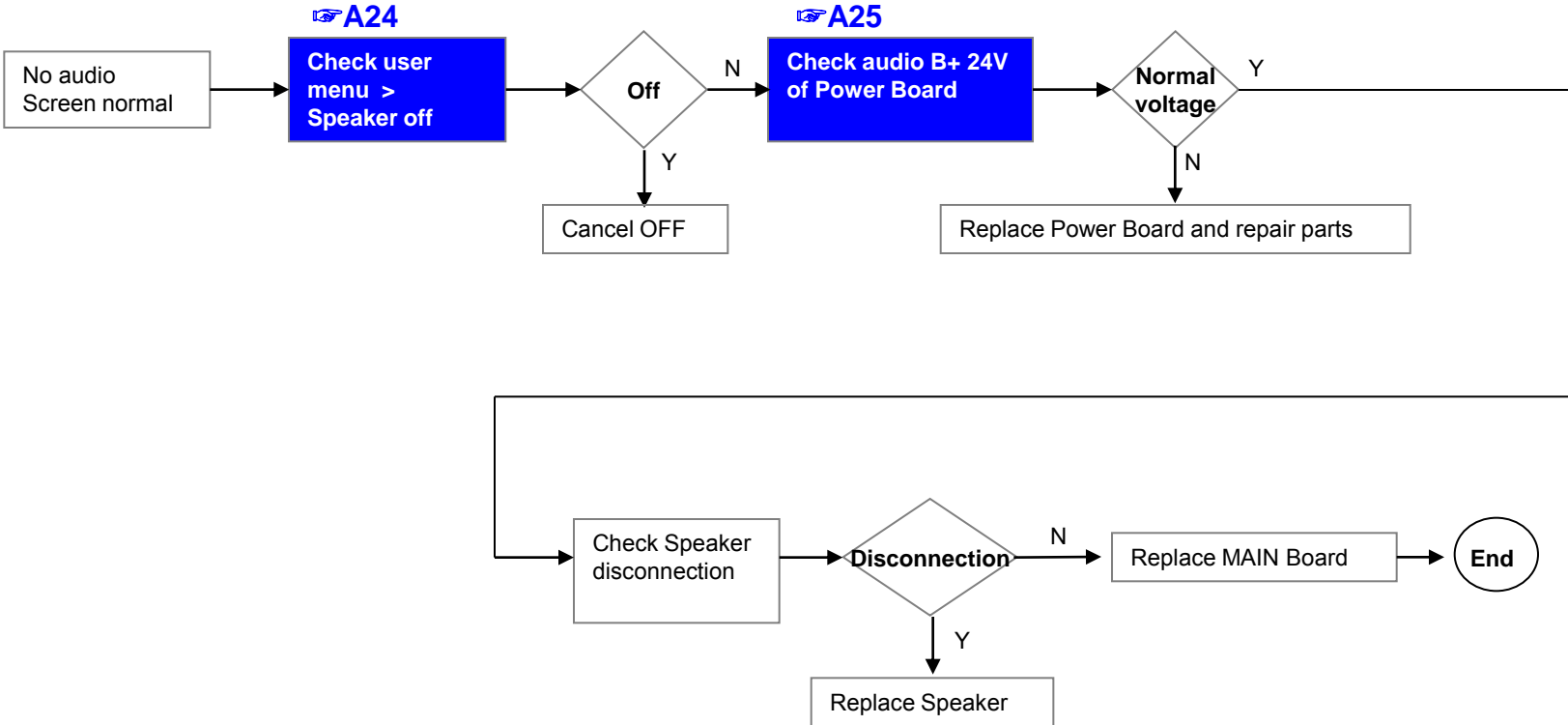


* Please refer to the all cases which can be displayed on power off mode.

Status	Power off List	Explanation
Normal	"POWEROFF_REMOTEKEY"	Power off by REMOTE CONTROL
	"POWEROFF_OFFTIMER"	Power off by OFF TIMER
	"POWEROFF_SLEEPTIMER"	Power off by SLEEP TIMER
	"POWEROFF_INSTOP"	Power off by INSTOP KEY
	"POWEROFF_AUTOOFF"	Power off by AUTO OFF
	"POWEROFF_ONTIMER"	Power off by ON TIMER
	"POWEROFF_RS232C"	Power off by RS232C
	"POWEROFF_RESREC"	Power off by Reserved Record
	"POWEROFF_RECEND"	Power off by End of Recording
	"POWEROFF_SWDOWN"	Power off by S/W Download
	"POWEROFF_UNKNOWN"	Power off by unknown status except listed case
Abnormal	"POWEROFF_ABNORMAL1"	Power off by abnormal status except CPU trouble
	"POWEROFF_CPUABNORMAL"	Power off by CPU Abnormal

Standard Repair Process

LCD TV	Error symptom	C. Audio error	Established date	2012. 12 .06	
		No audio/ Normal video	Revised date		



Standard Repair Process

LCD TV

Error symptom

C. Audio error

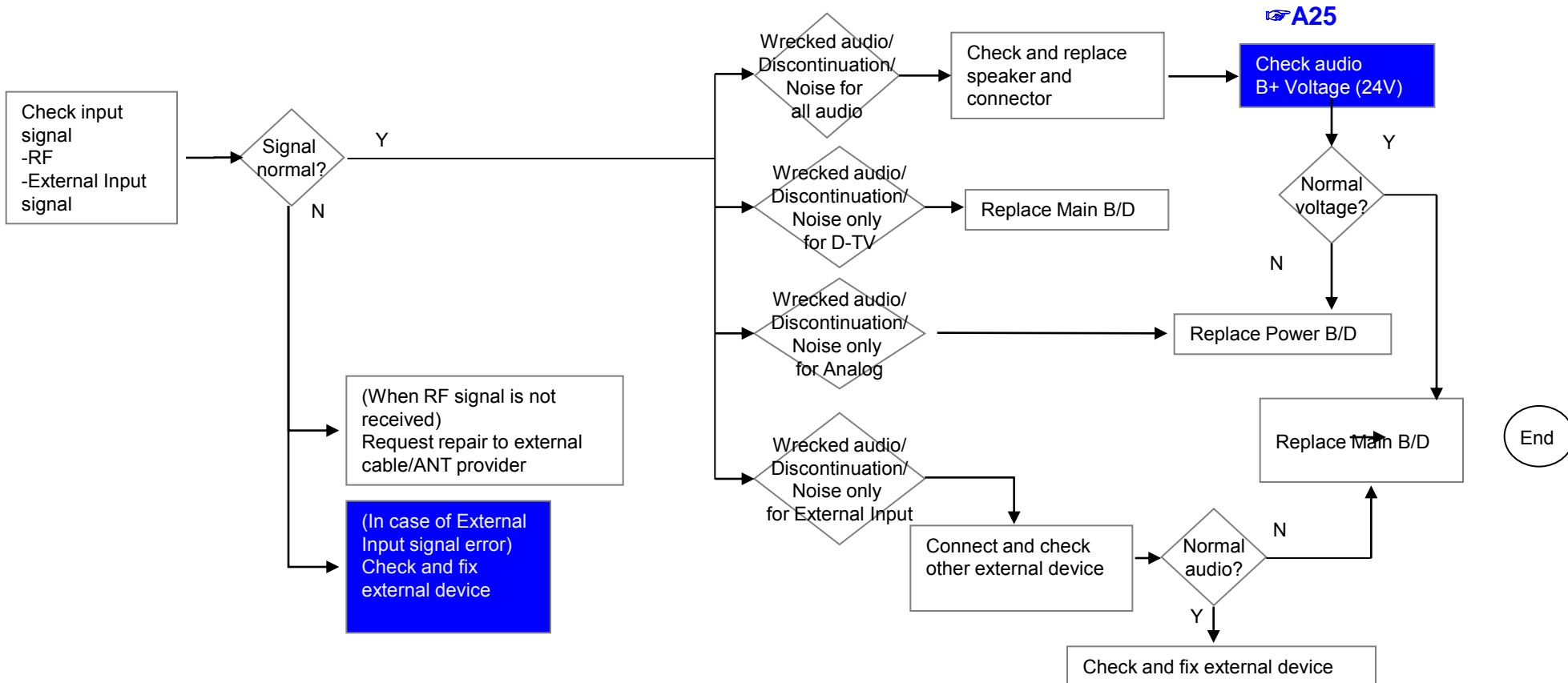
Established date

2012. 12 .06

Wrecked audio/ discontinuation/noise

Revised date

→ abnormal audio/discontinuation/noise is same after “Check input signal” compared to No audio



Standard Repair Process

LCD TV

Error symptom

D. General Function Problem

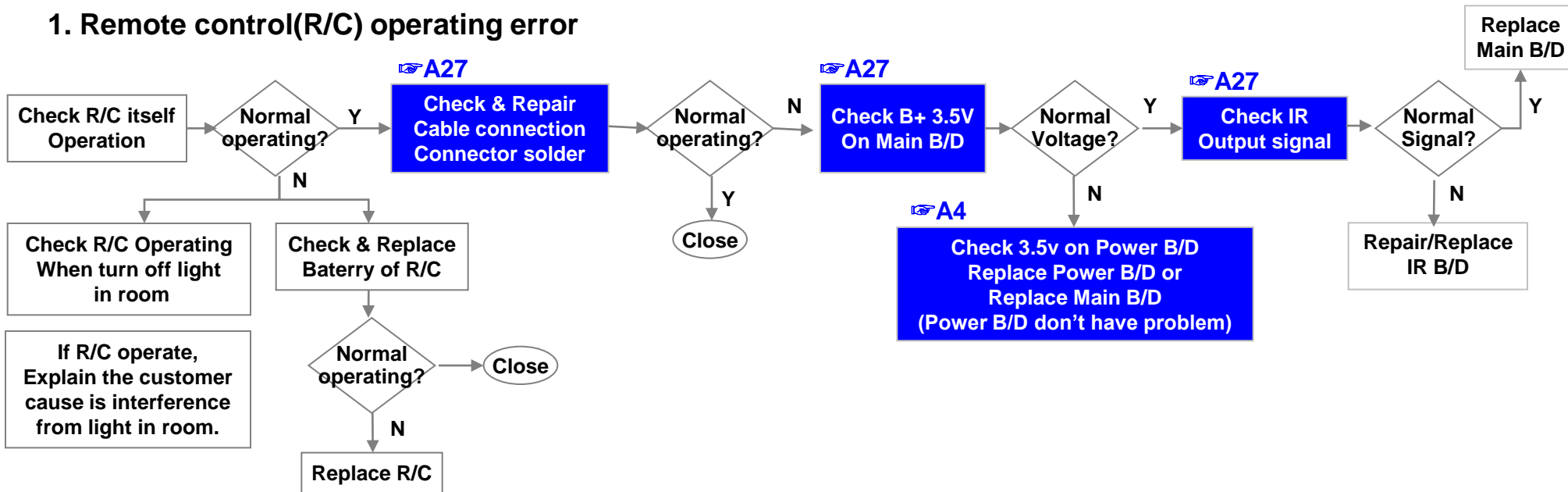
Established date

2012. 12 .06

Remote control & Local switch checking

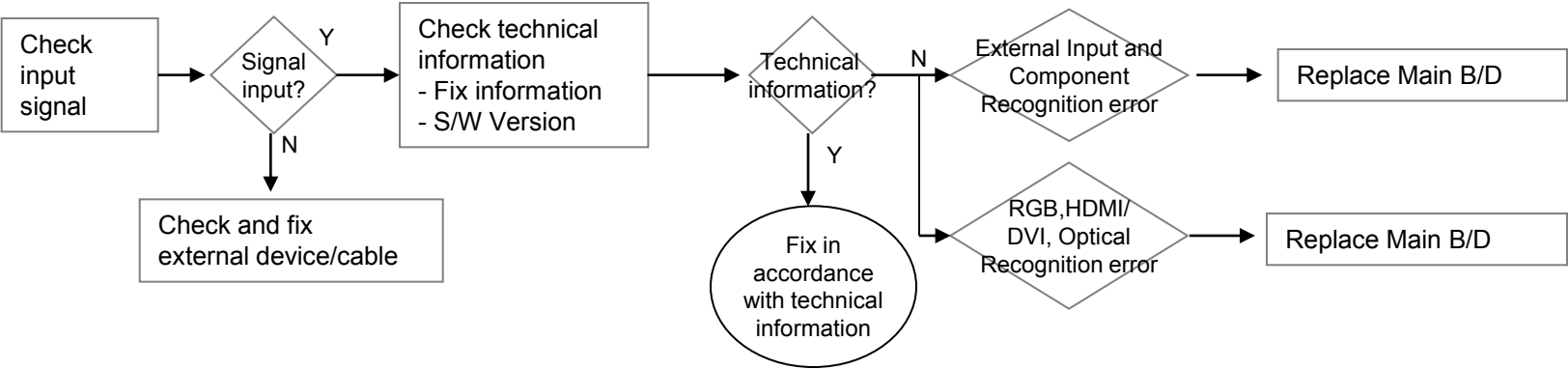
Revised date

1. Remote control(R/C) operating error



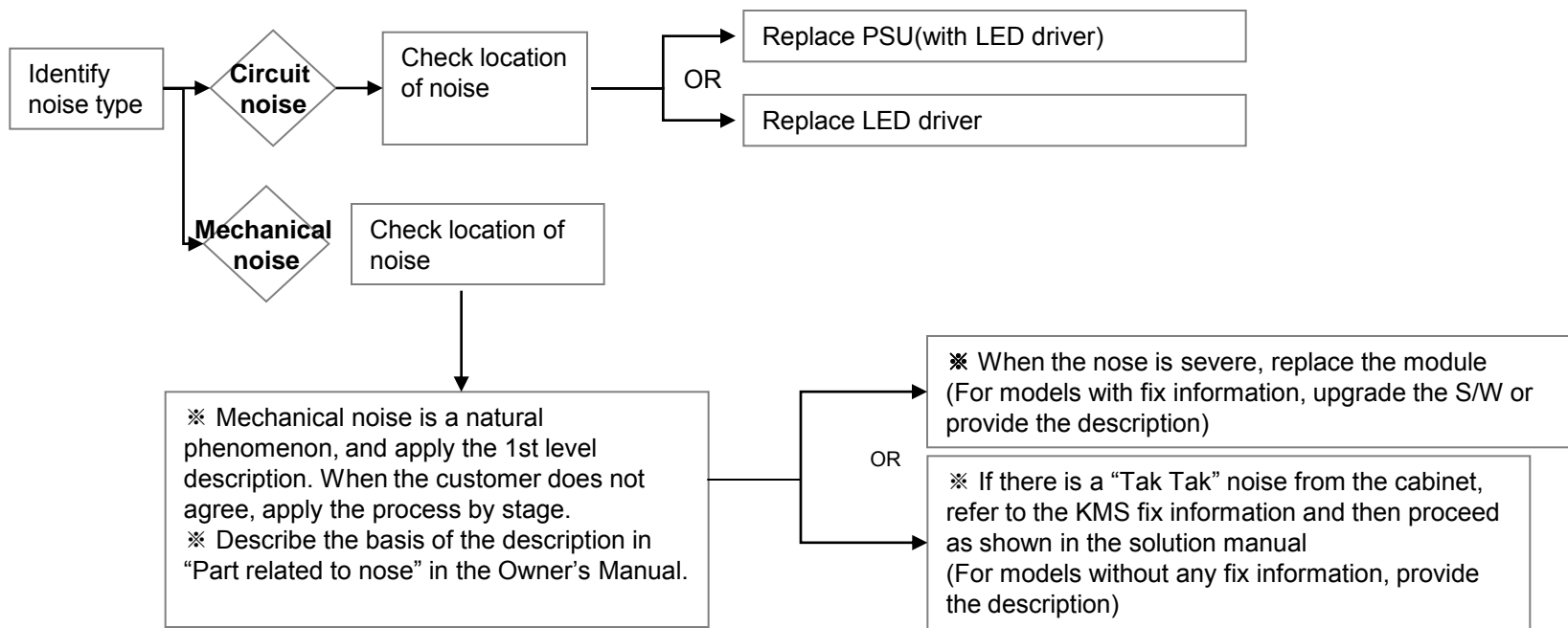
Standard Repair Process

LCD TV	Error symptom	D. Function error	Established date	2012. 12 .06	
		External device recognition error	Revised date		



Standard Repair Process

LCD TV	Error symptom	E. Noise	Established date	2012. 12 .06	
		Circuit noise, mechanical noise	Revised date		



Standard Repair Process

LCD TV

Error
symptom

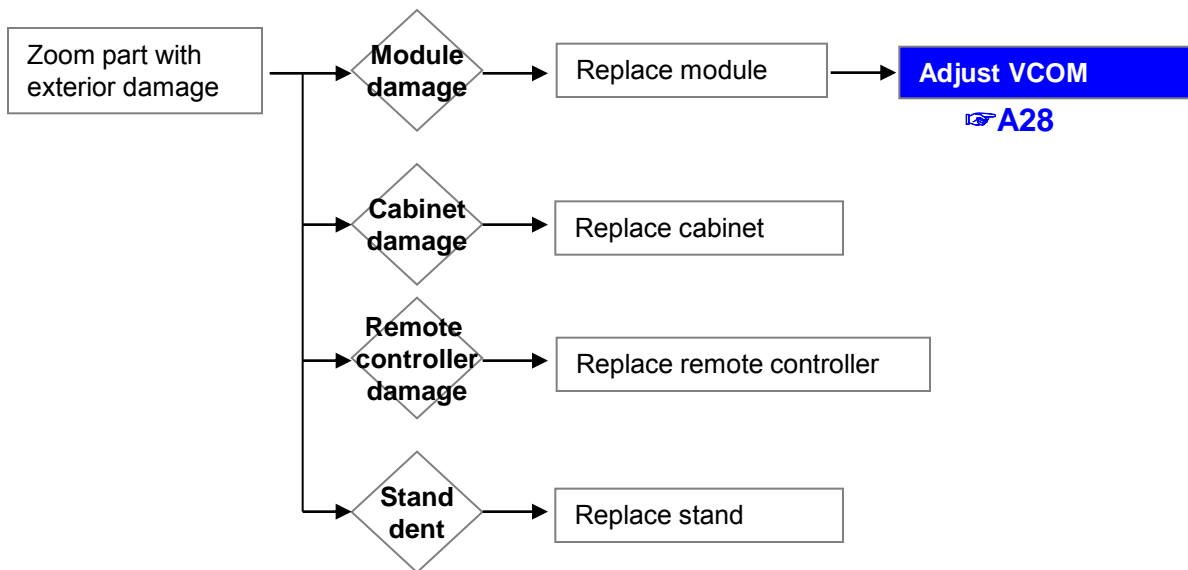
F. Exterior defect

Established
date

2012. 12 .06

Exterior defect

Revised date



Standard Repair Process

LCD TV

Error symptom

G. Network Error

Established date

2012. 12 .06

Exterior defect

Revised date

Check Network status

Check Wired ethernet cable connection
Check whether AP has a problem or not.
Setting → Network → Network Status

Normal Signal?

Y

N

Check connection with AP or internet
(WiFi = AP)
(Wired = ethernet port)

Close

Check Network connection
Case1 WiFi .
- Check AP status
Case2 Wired
- Check ethernet Port

Normal setting?

Y

N

Try to new network connection
(match with AP and ether setting)

Normal Picture?

N

Y

Close

A7

Check S/W Version

SVC Bulletin?

N

Y

S/W Upgrade

Normal Picture?

N

Y

Close

Check Wired, Wifi status
(Cable / sub Assy)

Replace Main B/D

Standard Repair Process

LCD TV

Error symptom

G. CI+ Competibility Error

Established date

2012. 12 .06

Exterior defect

Revised date

Check CI CAM status

Check defect CI slot pin
Check it's worked CI+ 1.2 or 1.3
Setting → Antenna → CI information

Read Information?

Y

Check status of CI+ Key in the In-start menu

Is there CI+ key?

Y

Check CAM S/W Version

SVC Bulletin?

N

Check Wired, Wifi status (Cable / sub Assy)

Replace Main B/D

N

Check damage of CI slot pin
Or damage of CI CAM

Close

N

Replace Main B/D
Or
Download CI+ Key

CAM S/W Upgrade By OTA

Normal Picture?

N

Close

Y

Old version of CI+ 1.2 CAM is not worked at the TV that is supported CI+ 1.3

→ Check SVC Bulletin

Contents of LCD TV Standard Repair Process Detail Technical Manual

Continued from previous page

No.	Error symptom	Content	Page	Remarks
21	B. Power error_No power	Check front display LED	A17	
22		Check power input Voltage & ST-BY 3.5V	A18	
23		Checking method when power is ON	A19	
24		POWER BOARD voltage measuring method	A5	
25				
26	B. Power error_Off when on, off while viewing	POWER OFF MODE checking method	A22	
27	B. Power error_Off when on, off while viewing	POWER BOARD PIN voltage checking method	A19	
28	C. Audio error_No audio/Normal video	Checking method in menu when there is no audio	A24	
29		Voltage and speaker checking method when there is no audio	A25	
30	C. Audio error_Wrecked audio/discontinuation	Voltage and speaker checking method in case of audio error	A25	
31	D. Function error_ No response in remote controller, key error	Remote controller operation checking method	A27	
32	D. VCOM Adjustment	Sequence of the Vcom adjustment	A28	

Standard Repair Process Detail Technical Manual

LCD TV

Error
symptom

A. Video error_No video/Normal audio

Established
date

2012. 12 .06

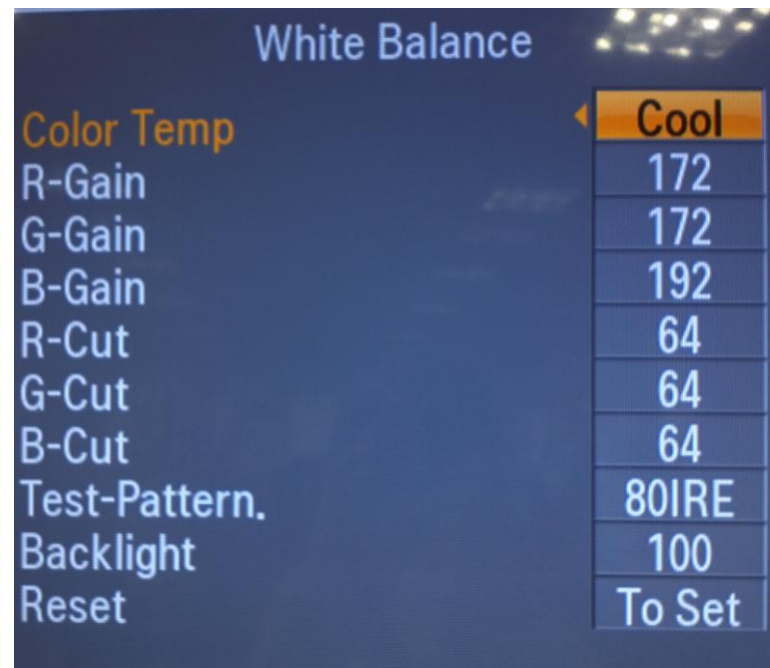
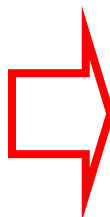
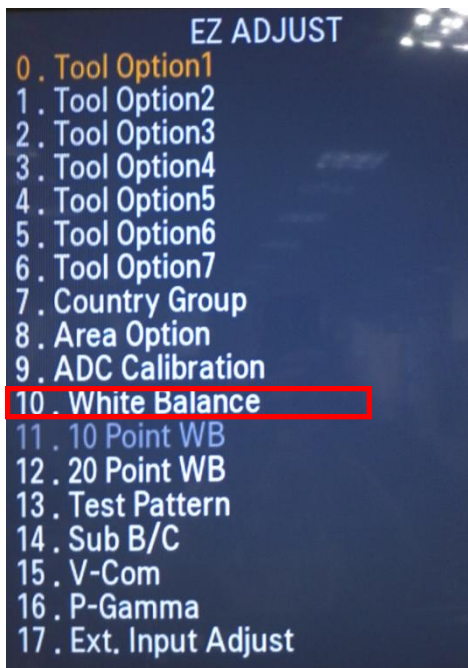
Content

Check White Balance value

Revised
date

A4

<ALL MODELS>



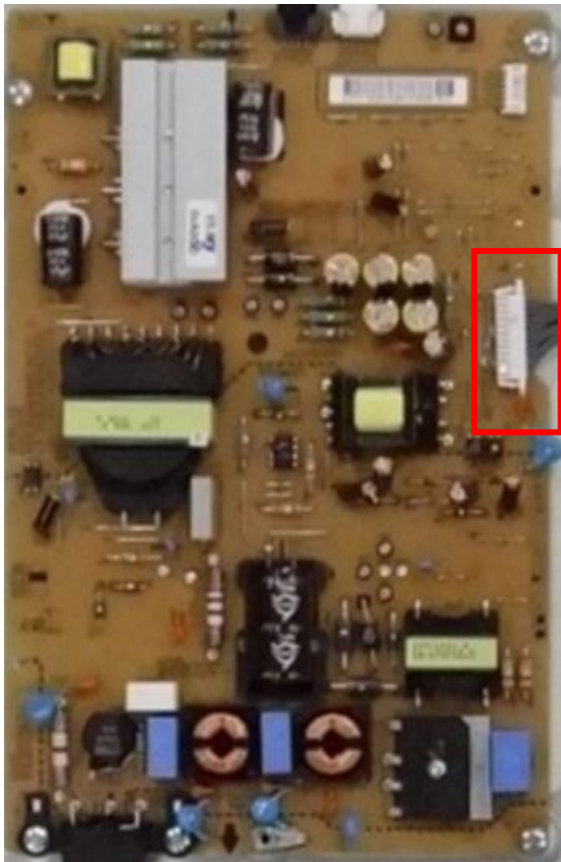
Entry method

1. Press the ADJ button on the remote controller for adjustment.
2. Enter into White Balance of item 10.
3. After recording the R, G, B (GAIN, Cut) value of Color Temp (Cool/Medium/Warm), re-enter the value after replacing the MAIN BOARD.

Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	A. Video error_No video/ Audio	Established date	2012. 12 .06	
	Content	Power Board voltage measuring method	Revised date		A5

Check the DC 24V, 12V, 3.5V.

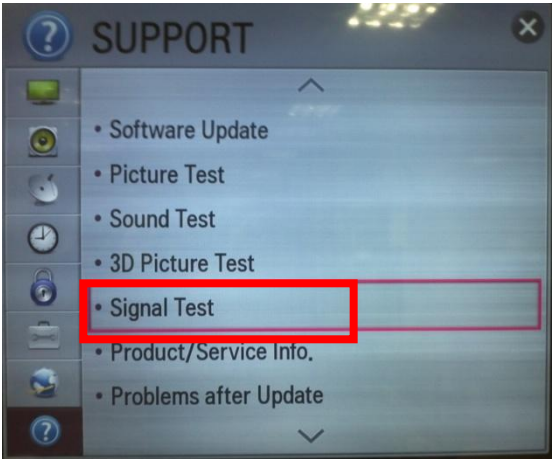


24 Pin (Power Board ↔ Main Board)			
SMAW200-H24S			
1	Power on	2	Inverter On/off
3	3.5V	4	PWM Dim #1
5	3.5V	6	PWM Dim #2
7	GND	8	GND
9	24V	10	24V
11	GND	12	GND
13	12V	14	12V
15	12V	16	24V
17	GND	18	GND
19	GND	20	GND
21	GND	22	L/DIM0_VS
23	L/DIM0_MOSI	24	L/DIM0_SCLK

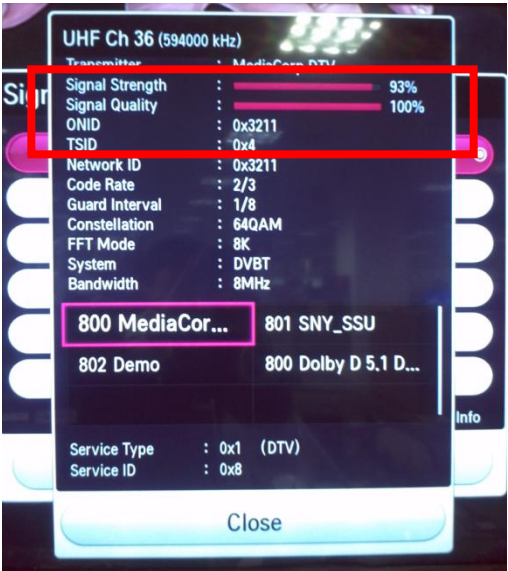
Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	A. Video error_Video error, video lag/stop	Established date	2012. 12 .06	
	Content	TUNER input signal strength checking method	Revised date		A6

<ALL MODELS>



MENU → support → signal test
→ select channel



When the signal is strong, use the attenuator (-10dB, -15dB, -20dB etc.)



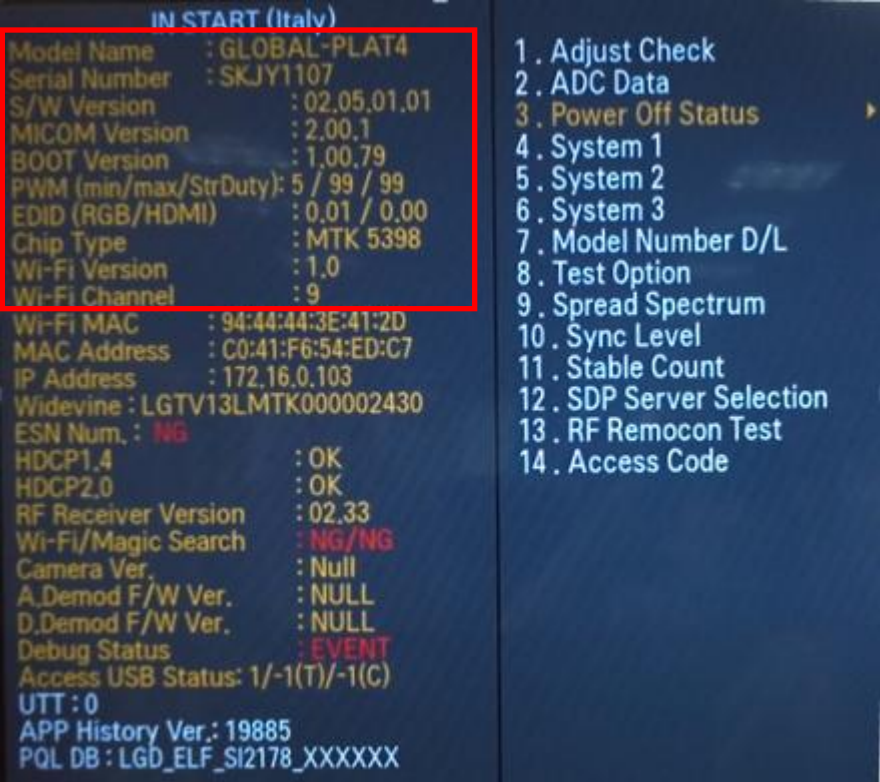
Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	A. Video error_Video error, video lag/stop	Established date	2012. 12 .06	A7
	Content	LCD-TV Version checking method	Revised date		

<ALL MODELS>

1. Checking method for remote controller for adjustment

Version



Press the IN-START with the remote controller for adjustment

Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	A. Video error _Vertical/Horizontal bar, residual image, light spot	Established date	2012. 12 .06	
	Content	LCD TV connection diagram (1)	Revised date		A8

<ALL MODELS>



As the part connecting to the external input, check the screen condition by signal

Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	A. Video error_Video error, video lag/stop	Established date	2012. 12 .06	
	Content	TUNER checking part	Revised date		A9

<ALL MODELS>

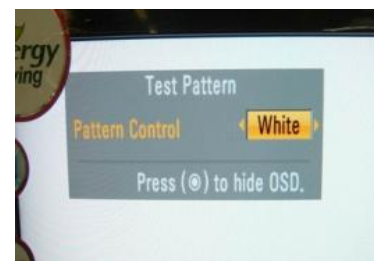
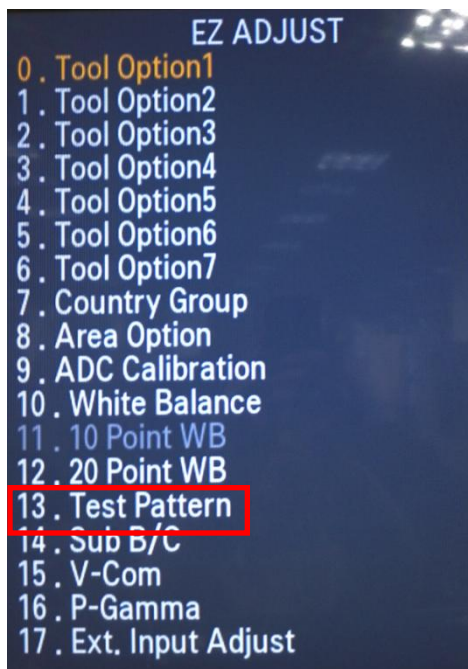


Checking method:

- 1. Check the signal strength or check whether the screen is normal when the external device is connected.
- 2. After measuring each voltage from power supply, finally replace the MAIN BOARD.

Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	A. Video error_Color error	Established date	2012. 12 .06	
	Content	Adjustment Test pattern - ADJ Key	Revised date		A12



You can view 6 types of patterns using the ADJ Key

Checking item : 1. Defective pixel 2. Residual image 3. MODULE error (ADD-BAR,SCAN BAR..)
4.Video error (Classification of MODULE or Main-B/D!)

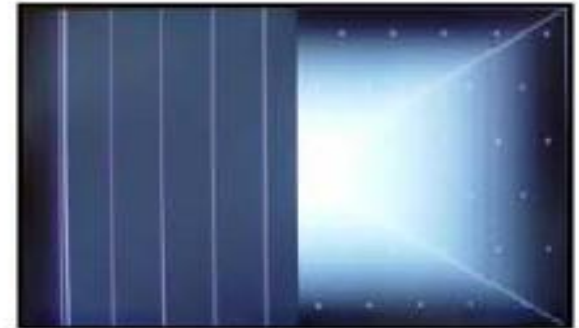
Appendix : Exchange EPI Cable or Main B/D (1)



Solder defect, CNT Broken



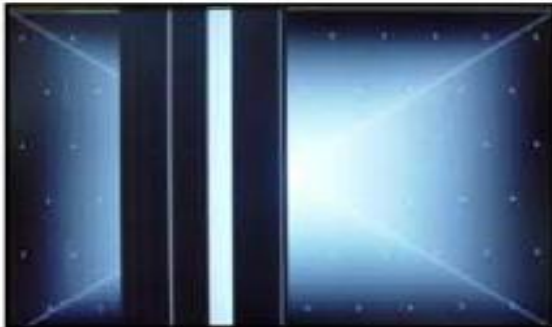
Solder defect, CNT Broken



Solder defect, CNT Broken



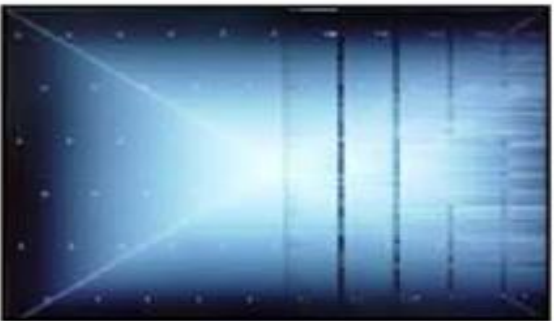
Solder defect, CNT Broken



Solder defect, CNT Broken



Abnormal Power Section



Solder defect, Short/Crack



Abnormal Power Section



Solder defect, Short/Crack

Appendix : Exchange EPI Cable or Main B/D (2)



Abnormal Power Section



Abnormal Power Section



Solder defect, Short/Crack



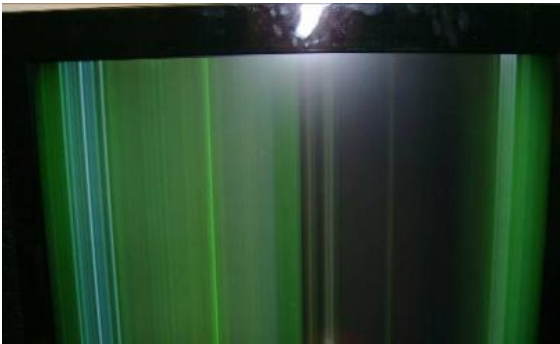
Solder defect, Short/Crack



Fuse Open, Abnormal power section



Abnormal Display



GRADATION



Noise



GRADATION

Appendix : Exchange LPB(LED driver)



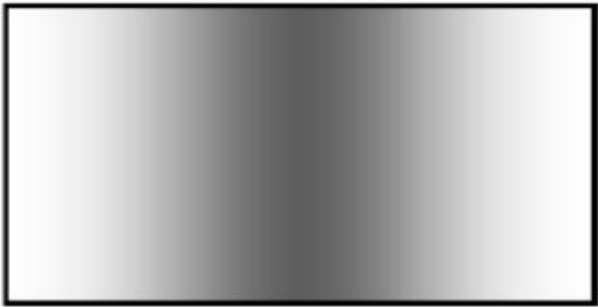
No Light



Dim Light



Dim Light



Dim Light

Appendix : Exchange the Module (1)



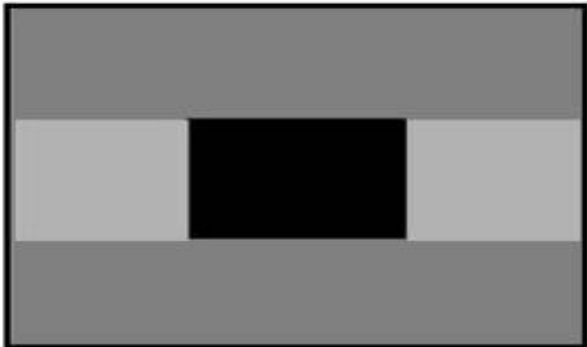
Panel Mura, Light leakage



Panel Mura, Light leakage



Press damage



Crosstalk



Press damage



Crosstalk

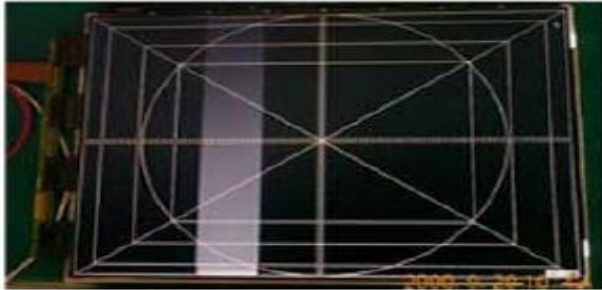


Press damage

Un-repairable Cases

In this case please exchange the module.

Appendix : Exchange the Module (2)



Vertical Block
Source TAB IC Defect



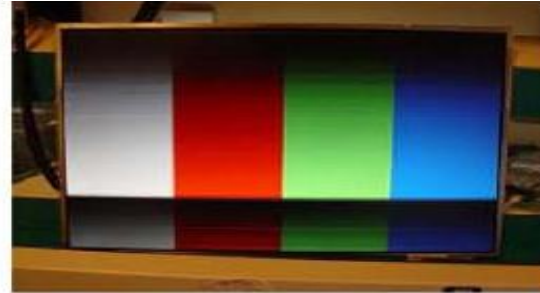
Vertical Line
Source TAB IC Defect



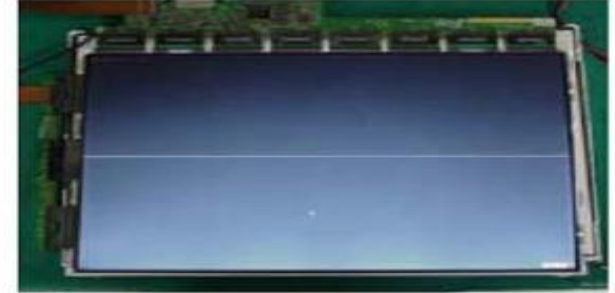
Vertical Block
Source TAB IC Defect



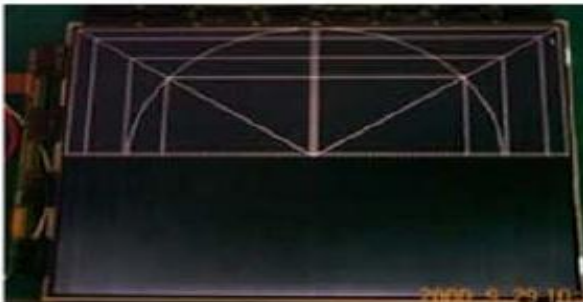
Horizontal Block
Gate TAB IC Defect



Horizontal Block
Gate TAB IC Defect



Horizontal line
Gate TAB IC Defect



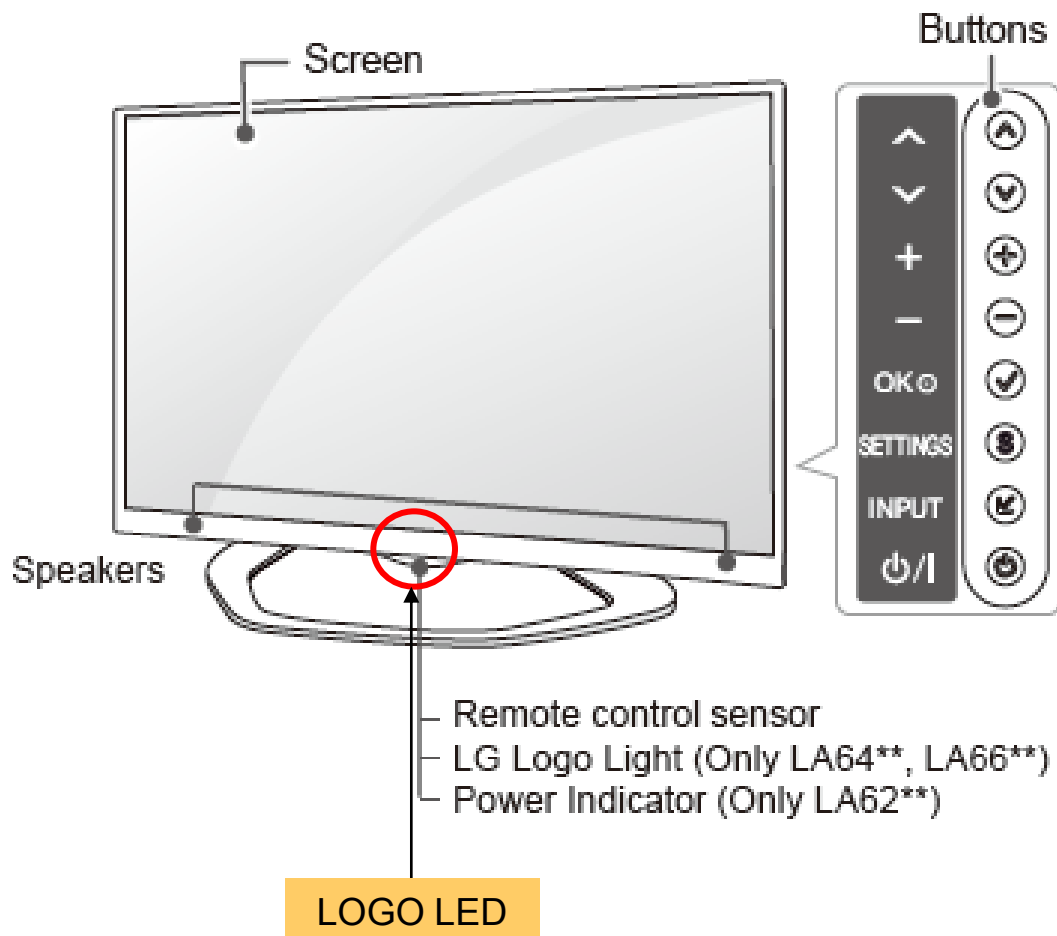
Horizontal Block
Gate TAB IC Defect

Un-repairable Cases

In this case please exchange the module.

Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	B. Power error _No power	Established date	2012. 12 .06	
	Content	Check front display LED	Revised date		A17



You can set the LG Logo Light to on or off by selecting OPTION in the main menus.

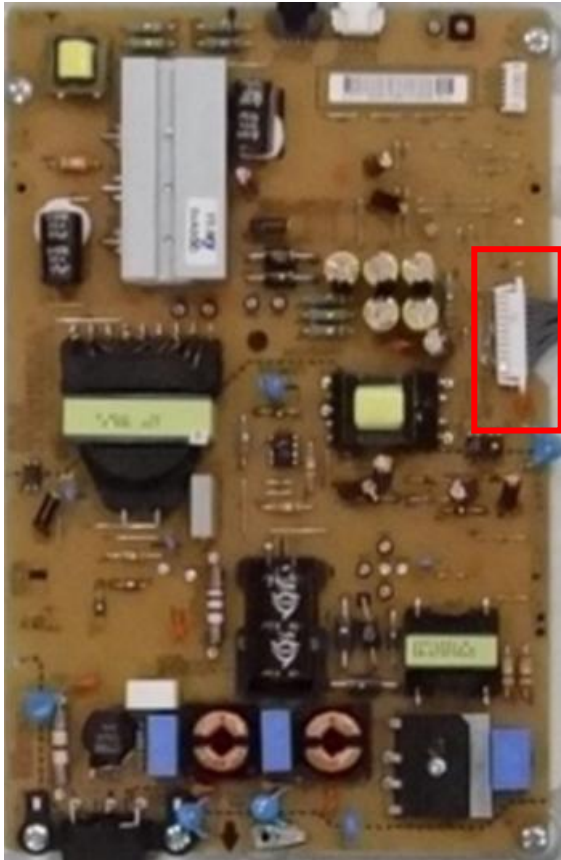
Front LOGO LED control in the status of ST-BY Condition:
Menu → Option → LG Logo Light
→ Brightness(OFF,LOW,MIDDLE,HIGH)

Front LOGO LED control in the status of Power On Condition:
Menu → Option → LG Logo Light
→ Duration(off, off after 10min)

Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	B. Power error _No power	Established date	2012. 12 .06	
	Content	Check power input voltage and ST-BY 3.5V	Revised date		A18

For '10 models, there is no voltage out for st-by purpose.
When st-by, only 3.5V is normally on.



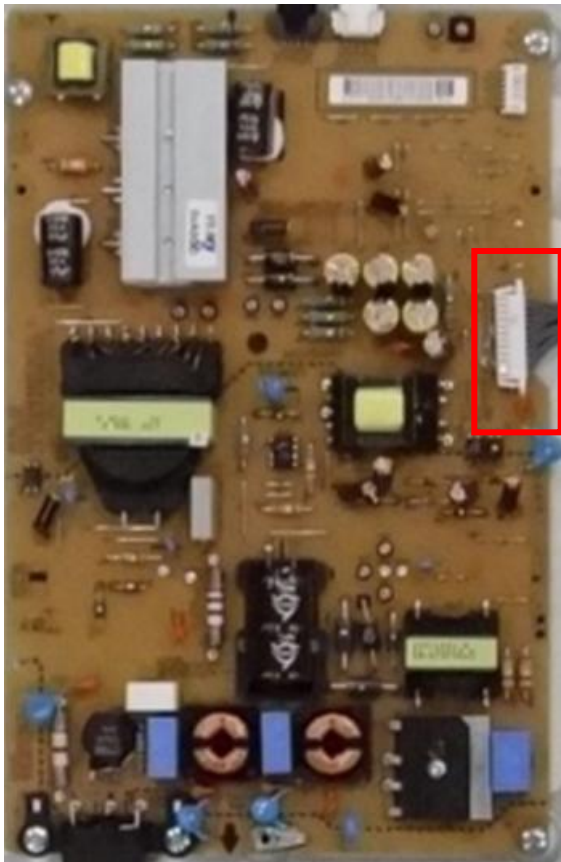
Check the DC 24V, 12V, 3.5V.

24 Pin (Power Board ↔ Main Board)			
SMAW200-H24S			
1	Power on	2	Inverter On/off
3	3.5V	4	PWM Dim #1
5	3.5V	6	PWM Dim #2
7	GND	8	GND
9	24V	10	24V
11	GND	12	GND
13	12V	14	12V
15	12V	16	24V
17	GND	18	GND
19	GND	20	GND
21	GND	22	L/DIMO_VS
23	L/DIM0_MOSI	24	L/DIM0_SCLK

Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	B. Power error _No power	Established date	2012. 12 .06	
	Content	Checking method when power is ON	Revised date		A19

Check “power on” pin is high

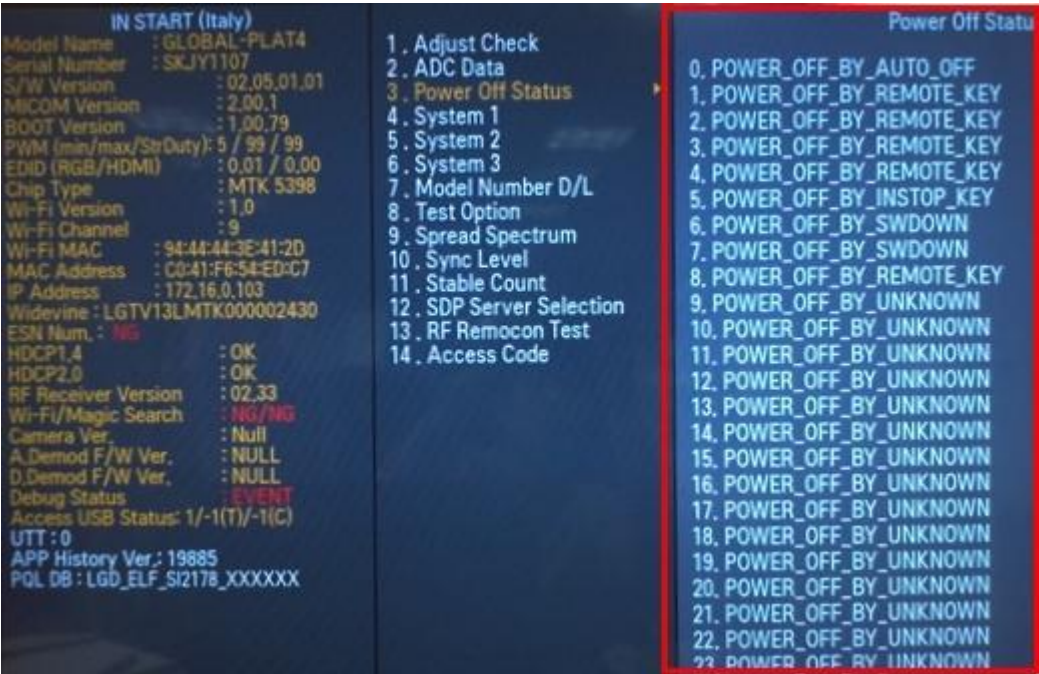


24 Pin (Power Board ↔ Main Board)			
SMAW200-H24S			
1	Power on	2	Inverter On/off
3	3.5V	4	PWM Dim #1
5	3.5V	6	PWM Dim #2
7	GND	8	GND
9	24V	10	24V
11	GND	12	GND
13	12V	14	12V
15	12V	16	24V
17	GND	18	GND
19	GND	20	GND
21	GND	22	L/DIMO_VS
23	L/DIM0_MOSI	24	L/DIM0_SCLK

Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	B. Power error _Off when on, off whiling viewing	Established date	2012. 12 .06	
	Content	POWER OFF MODE checking method	Revised date		A22

<ALL MODELS>



Entry method

- 1. Press the IN-START button of the remote controller for adjustment
- 2. Check the entry into adjustment item 3

Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	C. Audio error_No audio/Normal video	Established date	2012. 12 .06	
	Content	Checking method in menu when there is no audio	Revised date		A24

<ALL MODELS>



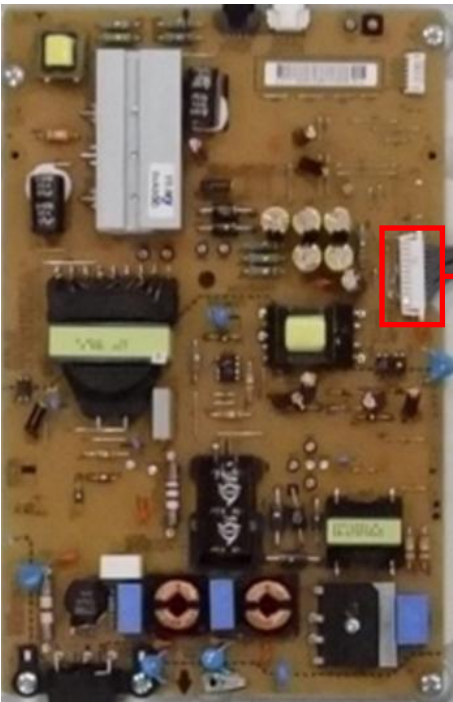
Checking method

1. Press the MENU button on the remote controller
2. Select the SOUND function of the Menu
3. Change TV Sound Out to TV Speaker

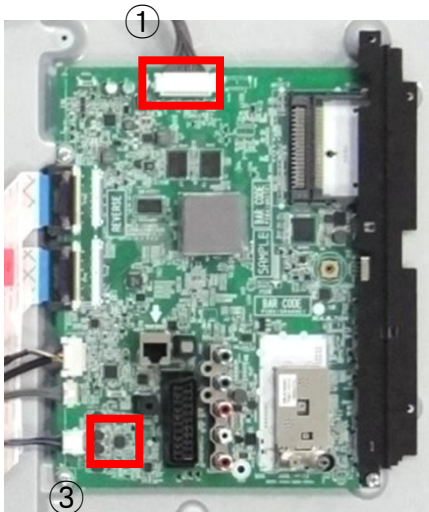
Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	C. Audio error_No audio/Normal video	Established date	2012. 12 .06	
	Content	Voltage and speaker checking method when there is no audio	Revised date		A25

<ALL MODELS>



24 Pin (Power Board ↔ Main Board)			
SMAW200-H24S			
1	Power on	2	Inverter On/off
3	3.5V	4	PWM Dim #1
5	3.5V	6	PWM Dim #2
7	GND	8	GND
9	24V	10	24V
11	GND	12	GND
13	12V	14	12V
15	12V	16	24V
17	GND	18	GND
19	GND	20	GND
21	GND	22	L/DIMO_VS
23	L/DIM0_MOSI	24	L/DIM0_SCLK



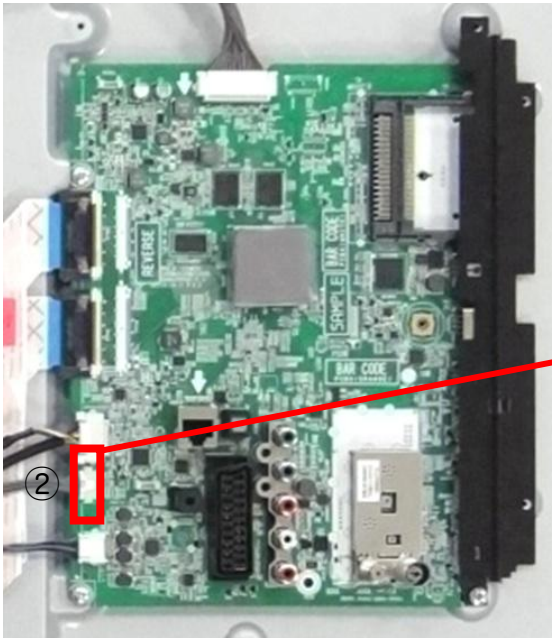
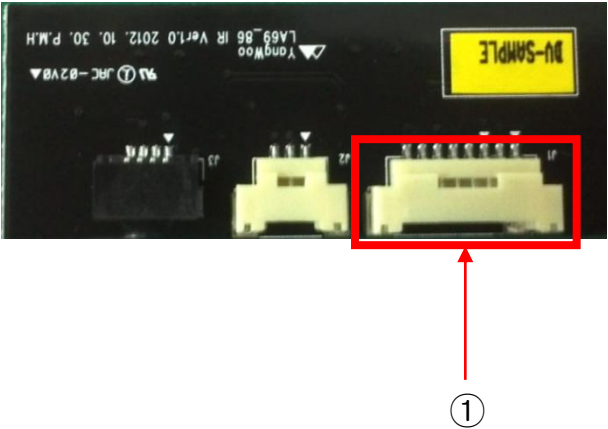
Checking order when there is no audio

- ① Check the contact condition of or 24V connector of Main Board
- ② Measure the 24V input voltage supplied from Power Board
(If there is no input voltage, remove and check the connector)
- ③ Connect the tester RX1 to the speaker terminal and if you hear the Chik Chik sound when you touch the GND and output terminal, the speaker is normal.

Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	D. Function error_ No response in remote controller, key error	Established date	2012. 12 .06	
	Content	Remote controller operation checking method	Revised date		A27

<ALL MODELS>



P4101	
1	GND
2	KEY1
3	KEY2
4	+3.5V_ST
5	GND
6	LOGO/LED_R
7	IR
8	GND

Checking order

- 1, 2. Check IR cable condition between IR & Main board.
- 3. Check the st-by 3.5V on the terminal 4.
- 4. When checking the Pre-Amp when the power is in ON condition, it is normal when the Analog Tester needle moves slowly, and defective when it does not move at all.

Standard Repair Process Detail Technical Manual

LCD TV	Error symptom	D. VCOM Adjustment	Established date	2012. 12 .06	
	Content	Sequence of the Vcom adjustment	Revised date		A28

1. Case

- LCD module change
- T-Con board change

2. Equipment

- Service Remote controller

3. Adjust sequence

- Press the 'adj' key
- select V-COM
- As pushing the right or the left button on the remote controller, And find the V-COM value Which is no or minimized the Flicker.
(If there is no flicker at default value, Press the exit key and finish the VCOM adjustment.)
- Push the OK key to store the value. Then the message "Saving OK" is pop.
- Press the exit key to finish V-COM adjustment.

